DTU Library

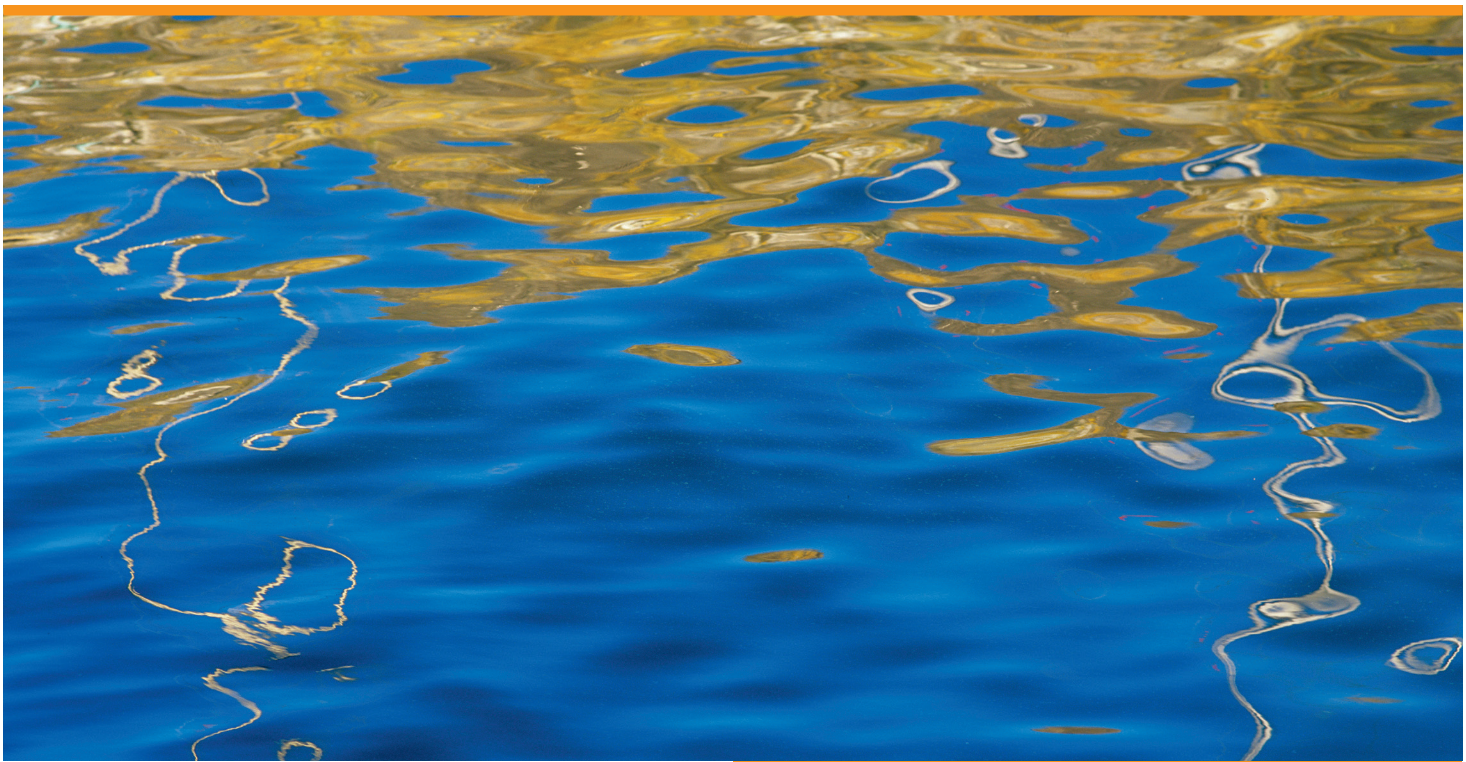
Workshop on Baltic Sea Trout, Helsinki, Finland, 11-13 October 2011

Pedersen, Stig; Heinimaa, Petri ; Pakarinen, Tapani

Publication date:
2012

Document Version
Publisher's PDF, also known as Version of record

Workshop on Baltic Sea Trout
Helsinki, Finland, 11-13 October 2011



DTU Aqua Report No 248-2012
By Stig Pedersen, Petri Heinimaa
and Tapani Pakarinen (eds.)

DTU Aqua
National Institute of Aquatic Resources

Workshop on Baltic Sea Trout

Helsinki, Finland, 11-13 October 2011

DTU Aqua Report No 248-2012

Stig Pedersen, Petri Heinimaa and Tapani Pakarinen (eds.)

Contents

Abstract

Recent knowledge on sea trout populations in the Baltic Sea was presented to managers in Helsinki 11-13 October 2011 at the Workshop on Baltic Sea Trout. The meeting was attended by scientists from all Baltic countries and relevant managers from all countries except Russia, the EU Commission (DG MARE) and HELCOM. Russian scientist from Sct. Petersburg presented available information also from Kaliningrad. From Germany no information was available from the Schleswig Holstein area. The situation for sea trout in Norway was presented by Norwegian expert Björn Barlaup from LFI, Bergen.

In the Baltic Sea the situation for sea trout populations varies considerably. Especially in the northern part of the Bothnian Bay, in the Bothnian Sea and parts of Gulf of Finland sea trout populations are severely endangered from early by catch in fisheries for whitefish and pikeperch. Illegal fishing either in the sea or in fresh water is a major problem in the eastern and south eastern part of the Baltic Sea.
Improvements in regulation, e.g. establishing closed areas at river mouths are strongly needed all around Finland, in the Bothnian Bay, in Gulf of Finland and in the eastern part of the Baltic Sea. Improvements in internationally coordinated regulation are especially needed in northern and eastern sea areas.

The most severe environmental threats to sea trout populations are related to migration obstacles where problems are severe in almost all parts of the Baltic Sea. Problems related to habitat quality are also significant in almost half of the areas, and less severe in the rest.
Problems related to stocking are less severe. Most seriously they are related to overfishing in the area around Finland and in two countries to genetic contamination of wild populations.

Possible solutions and ways forward to problems for the sea trout were discussed and a set of statements formulated.

Statements - Status on Sea trout populations

In the south west part of the Baltic most stocks have improved (Denmark and southern Sweden). Many stocks in the rest of the Baltic Sea area are low but improving or stable. However, some stocks are close to extinction.
Particular problems are observed in stocks in ICES SD 30-32 (Gulf of Bothnia, Gulf of Finland).

Problems may be divided in 3 major groups:

Fishing. In relation to fishing the major problems leading to insufficient spawning populations were identified as: hindrance in migration to and from rivers, overfishing as by-catch in mixed fishery with gillnets, poaching.
The following solutions are suggested:

- Closed areas at river mouth – size and season according to biological characteristics of local stocks of trout and other target species.

- To avoid by-catch of sea trout gillnets should be set allowing at least 3 m of water above the net.

- Identification of spawning grounds and raising local interest in protecting.
- Changes of fishing regulations should have local participation and could be facilitated by providing information – also by feed-back on the effects from the changes.
- Technical measures should ensure that non-mature trout are not caught and preferably minimum size should ensure that at least half of the population can spawn .

Environment. Regarding environment the following crucial problems were identified: lack of connectivity, poor habitat and low water quality, degraded riparian areas.
The following solutions are suggested:

- Improve connectivity in migration routes by removal of barriers. As alternative, construction of fish passes (preferably natural like bypasses). Firstly, genetic variability should be ensured, secondly increases in production.
- Creation of barriers (dams or artificial lakes) must not interfere with migration and survival of sea trout.
- Continued restoration projects are urgently needed. Restoring spawning and nursery areas should be carried out.
- Continued liming of areas subjected to airborne pollution.
- Sufficient riparian zones should be retained or established to protect the streams from excessive sediment loads and providing shade and large woody debris.
- Effects from artificial rapidly changing hydrological conditions should be mitigated.

Enhancement stockings. Concerning stocking of fish the following subjects were identified as problematic: genetic risk, increased fishing pressure on weak wild stocks can be the result from stocking, stocked fish compete with wild fish.
The following solutions are suggested:

- Habitat improvement should be prioritized ahead of stocking.
- Stocking should be part of enhancement program only and if possible stocking of younger stages should be preferred to ensure as much natural selection as possible.
- Genetically, local stock with sufficient variation should be used .
- Stocking at the coast should be avoided.
- Evaluation of stocking programmes is recommended.

Exchange of information and experience of good practice through direct meetings at regular intervals is highly valuable.

Introduction

The background for the workshop is found in a longer development in focus on sea trout in the Baltic Sea.

In the 1980'ies information on sea trout is scarce, mostly focusing on the availability of spawners for production of stocking material.

In 1994 it was clearly stated that populations had a poor status in the north (both Sweden and Finland) as well as in Poland. The main threat at the time was overexploitation, but also habitat and environment problems were significant.

Since 1997 the ICES Working Group on Baltic Salmon and Trout has expressed continuous concern on the status of sea trout populations (ICES 1997). In 2011 it was recommended that strict technical measures were taken in the Gulf of Bothnia and parts of Gulf of Finland (ICES 2011).

The status of the Finnish trout populations were presented internationally for a larger audience in 2004 at the First International Symposium on Sea Trout in Cardiff (Jutila *et al.* 2006), again emphasizing that many natural northern populations have been wiped out and the remaining are in danger of extinction.

In 2007 focus on the Baltic sea trout was again increased at the Workshop on sea trout in Kotka, Finland (Heinimaa *et al.* 2007). The workshop presented the status of populations and resulted in increased focus on the sea trout.

In 2007 ICES established the Study Group on Data Requirements and Assessment Needs for Baltic Sea trout (SGBALANST) amongst others to assess the need for further assessment of sea trout populations in the Baltic Sea. The study group reported in 2009 on the assessment needs (ICES 2009), concluding that, even though a positive tendency could be observed in some populations, trout populations in the Bothnian Bay and Bothnian Sea area, and to a certain extent also in the Gulf of Finland were in a severe state with very low parr densities and worryingly small runs of spawners into the rivers.

In 2011 the HELCOM Salar project reported on both salmon and trout populations. The project gathered together estimates of production capacity in relation to present potential production (HELCOM 2011). The project thus provided an inventory of sea trout rivers, together with a list of 299 sea trout streams with urgent need of recovery.

The availability of new information on the poor status of numerous sea trout populations, particularly in the north and eastern parts, but also in other places, together with very little or no management initiative taken, provided the basis for arranging this workshop, with the main intention of presenting updated information and exchange valuable experience on the restoration of sea trout populations.

Development in sea trout populations in the Baltic Sea

For a number of years there has been increased focus on sea trout in the Baltic Sea area.
Due to a continuously increased concern on poor status of sea trout populations in certain areas a workshop was arranged in 2006 in Kotka, Finland (Heinimaa *et al.* 2007). At this workshop the updated status on populations was presented, together with an overview of the most significant threats.
The workshop in Kotka also summarized the main issues in a number of statements on the status of stocks, management measures needed to be taken in both marine and freshwater environment, and additional monitoring and research needs.

The ICES Working Group on Baltic Salmon and Trout (WGBAST) in 2007 suggested (ICES 2007) a study group to be formed with the task to a) determine if populations were in a state which justified further assessment, and, b) suggest methods to assess the trout populations. The ICES Study Group on data requirements and assessment needs for Baltic Sea trout (SGBALANST) was formed in 2007. The SGBALANST reported in 2008 (ICES 2008) on the availability of data for assessment, in 2009 (ICES 2009) on the need for assessment and in 2011 (ICES 2011) on methods for the assessment.

The SGBALANST concluded (ICES 2009) that trout populations in the Bothnian Bay and Bothnian Sea area and to a certain extent also in the Gulf of Finland were in a severe state with very low parr densities and worryingly small runs of spawners into the rivers. In recent years a positive tendency in population development in some the populations had been observed, but nonetheless populations were still at such a low level that trout populations must be considered at risk of extinction. Also in Gulf of Finland some trout populations have a poor status.

Furthermore it was concluded that the reason for the poor status was the early catch of sea trout mainly during the postsmolt stage as a by-catch in a heavy fishery targeting mainly whitefish in the Bothnian Bay and Bothnian Sea area and also pikeperch in the Gulf of Finland. In the Gulf of Finland trout populations were also affected by migration barriers, habitat quality and river flow conditions. Finally, SGBALANST stated that; 'A worrying tendency to very early catch, just after sea migration, is also found in the south eastern area in the eastern Poland area, where a large fraction of emigrating smolts have been observed to be caught in a coastal herring fishery. In most other parts of the Baltic the trout populations seem to be in a, if not optimal, then reasonably good state, habitat conditions taken into account.'

Although the recent years have brought increased focus on the sea trout, there was considerable concern long before this. Already in the 1990'ies the WGBAST expressed concern on the status of sea trout (ICES 1999) and already in the 1980'ies (ICES 1987) in the section on recruitment of sea trout, it was stated that: 'In Finland breeders are scarce'.
The fact that sea trout populations in the Bothnian Bay area were under heavy stress was clear in 1994, at the ICES Study Group on Anadromous Trout 1994 in Trondheim (ICES 1994).
It was stated that populations were overexploited, and that this was related to increases in coastal fishing in the 1950'ies, and furthermore, that sea trout were caught as a by-catch in the fishery for whitefish.

In a very recent project (HELCOM 2011) information on sea trout populations was updated and compiled. The current level of production of sea trout smolts was quantified and related to the potential production in rivers in the Baltic Sea area. Streams with original populations were classified into three different levels, clearly showing that particularly Bothnian Bay, Bothnian Sea, Gulf of Finland and Poland are problematic areas, where sea trout populations are doing very poorly.

Motivation for the workshop

From recent projects increased and recently updated information on the status of sea trout populations and problems for in the Baltic Sea has been available, but at the same time only limited or no action has been taken to safeguard threatened populations. The workshop, together with the present report, provided an opportunity to convey this information together with the experience from regional measures taken to counteract problems. Finally, possible ways forward to improve the situation general could be discussed involving both scientists and managers.

Summary of status

The most recent knowledge on the status of sea trout populations in the different countries was presented. In the Annex the presentations are summarized in separate chapters for each country.

Present status of sea trout populations was defined in the HELCOM Salar project according to origin of population and current production level. For streams with primarily genetically original populations the following classes were defined:

- RED: production level < 50 % of present stream production capacity,
- YELLOW: production level 50 – 80 % of present stream production capacity
- GREEN: production level > 80 % of present stream production capacity.

The updated status according to these production levels is presented in Fig. 1.

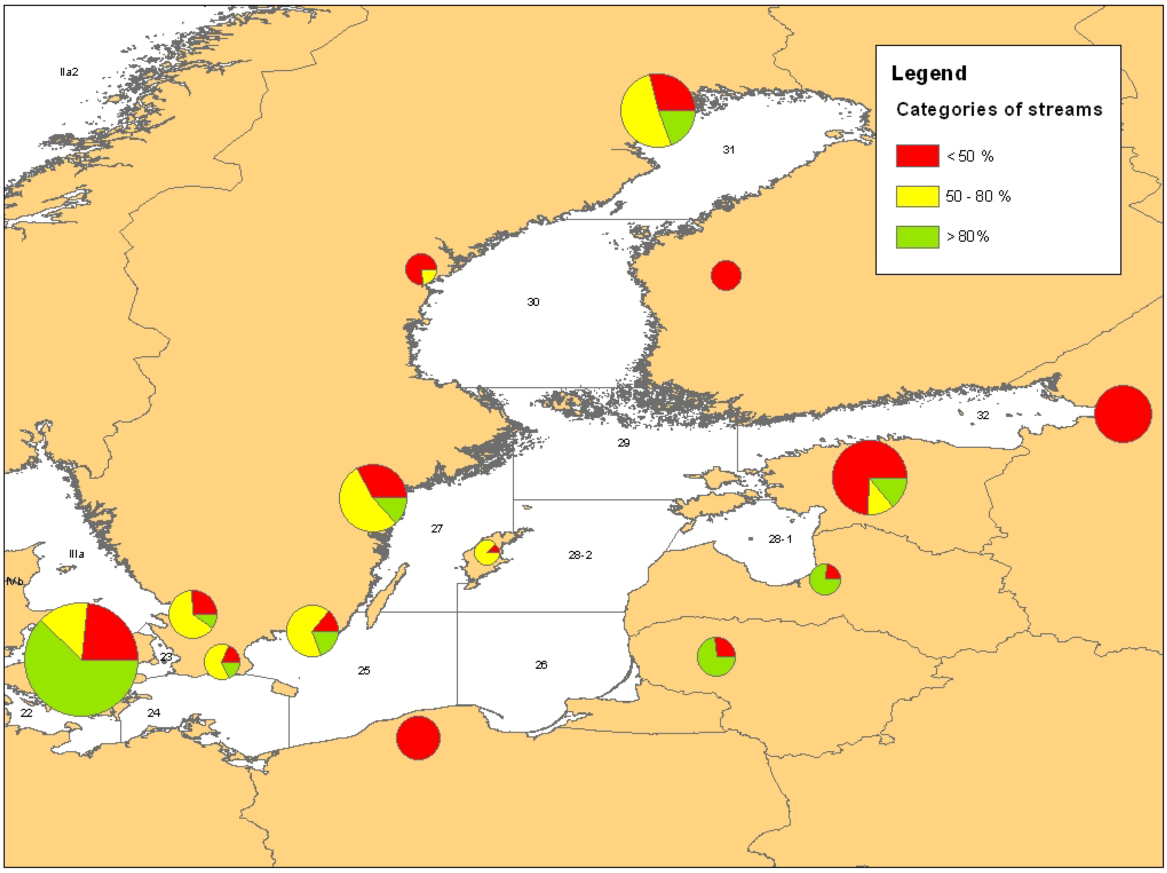


Fig. 1. Production status of sea trout streams with genetically original populations in countries around the Baltic Sea. Size of symbols corresponds to number of streams included (in Sweden many small streams are not included due to lack of knowledge). Colour codes: Red: production < 50 %, Yellow: production 50-80%, Green: production >80%.

There is very little knowledge on sea trout populations in the Russian Kaliningrad area and on wild populations in Germany. In the Mecklenburg - Western Pomerania there is knowledge on status of stocked streams and on one stream with wild original population, while there is no information from the Schleswig - Holstein area.
For Sweden, the status of streams is presented for different sea areas (ICES Subdivisions) and includes primarily larger streams where information is available. Many small streams are not included due to lack of knowledge.

Status is very low in all streams in Russia and Poland, and in the majority of the streams in Finland, Estonia and sea area 30 in Sweden. Only in Latvia, Lithuania and Denmark, the larger part of the streams are producing > 80 % of present capacity. In all other countries and areas (where information is available) the streams are quite far from optimal production levels.

An attempt to summarize the problems country by country and in different sea areas is presented in the table in Figure 2.

COUNTRY	SUBDIVISION	ENVIRONMENT				ENHANCEMENT STOCKING		FISHING		FISHERIES MANAGEMENT	
		Connectivity/ hydro power	Dredging	Riparian zone	Water quality	Genetic risk	Increased fishing	By-catches	Poaching	Regulation e.g. closed areas & periods	International cooperation needed
SWE	23-30	RED	RED	YELLOW	YELLOW	YELLOW	YELLOW	RED	GREEN	YELLOW	YELLOW
	31	RED	YELLOW	YELLOW	YELLOW	YELLOW	YELLOW	RED-BROWN	GREEN	RED-BROWN	RED-BROWN
FIN	29-32	RED	RED	YELLOW	RED	RED	RED-BROWN	RED-BROWN	YELLOW	RED-BROWN	RED-BROWN
RUS	26	RED-BROWN	YELLOW	RED	RED	YELLOW	GREEN	RED-BROWN	RED-BROWN	RED	YELLOW
	32	RED-BROWN	YELLOW	RED	YELLOW	YELLOW	RED	RED-BROWN	RED-BROWN	RED-BROWN	RED-BROWN
EST	28, 29, 32	RED-BROWN	RED	YELLOW	RED	YELLOW	RED	RED-BROWN	RED-BROWN	RED	RED-BROWN
LAT	28	RED-BROWN	YELLOW	YELLOW	RED	YELLOW	GREEN	RED-BROWN	RED-BROWN	YELLOW	YELLOW
LIT	26, 28	RED	YELLOW	YELLOW	YELLOW	YELLOW	GREEN	RED	RED-BROWN	RED-BROWN	YELLOW
POL	24-26	RED-BROWN	RED	RED	YELLOW	RED	RED	YELLOW	RED-BROWN	RED	YELLOW
GER	24-25	GREEN	YELLOW	YELLOW	YELLOW	YELLOW	RED	YELLOW	RED	YELLOW	YELLOW
DNK	22-25	RED	RED	RED	YELLOW	GREEN	GREEN	YELLOW	YELLOW	YELLOW	YELLOW

Key

RED-BROWN Problems are significant. Little or no actions to mitigate the problem

RED: Problems are significant. Some actions have been taken but there is still room to improve

YELLOW: Less severe problems or promising development, but still some improvement is needed

GREEN: not a problem or problems have been dealt with to sufficient extent.

Fig. 2. Overview of identified problems for sea trout populations in the countries around the Baltic Sea. Subdivison is ICES subdivision - see Fig. 1.

The sea trout faces a variety of problems in the Baltic Sea. In the freshwater environment an outstanding issue is problems with connectivity where only Germany finds that migration barriers are a minor problem. In all the rest of the areas it is considered to be a serious problem where only little or moderate improvement has taken place.

Habitat quality related issues is a more moderate problem with room for improvement in all countries and areas.

Water quality is in most areas a less severe problem, but in all countries and sea areas more or less improvement is needed.

Risk of genetic influence on wild populations from enhancement releases is considered to be a problem in Finland and Poland. In Poland there are no demands of stocked fish to belong to original populations from the rivers where fish are released. Only in Denmark, the release of trout is not considered to be genetically problematic, while in all other areas conditions are not critical but could be improved.

Releases may give rise to increased fishing pressure on wild populations, and this to a very problematic level in Finland. In four other countries/areas it is also considered to be problematic, while it is considered a minor or unproblematic issue in the rest of the countries/areas.

Capture of sea trout as by-catch in other fisheries is considered to be a major problem in about half of the countries / areas, problematic in two countries / areas and only in three countries/areas less problematic. This is problematic in all areas around Finland, where early capture of sea trout in fisheries mainly targeting whitefish or pikeperch is a major problem threatening sea trout populations.
Illegal fishing for sea trout in fresh and saline water is very problematic in the eastern and southern part of the Baltic Sea area. Only in Sweden is it considered not to be problematic.

Management actions are strongly needed in the northernmost part of Bothnian Bay, all around Finland and in the Russian part of Gulf of Finland as well as in Latvia and Lithuania. In three countries/areas management is considered to be inadequate, and in the rest of the areas minor improvements are needed.
International agreements on management issues are strongly needed in the northern part of the Bothnian Bay, all round Finland and in the Gulf of Finland. In the rest of the Baltic Sea the need for international management actions are considered to be less urgent.

In Norway sea trout populations have in recent years improved in northern areas, while they have reduced in southern areas. Reductions are sufficiently serious, that fisheries are being closed in southern parts. Regulation of the fishery for sea trout occurs in Norway on a regional level. Reasons for the problematic status includes acid rain in the south western parts, possibly changes in food availability, sea lice due to fish farming, diseases and sport fishing.

Summary of discussion

Stuart Reeves (EU Commission) questioned, whether problems for sea trout populations could be raised to the European Community level, because it seems that problems are mainly local. Sea trout is not included in the proposed multiannual salmon management plan (SAPII).
There was not a general agreement on this, because ICES workgroup WGBAST has recognized the need for a general assessment of sea trout, as evaluated by the ICES study group SGBALANST.

Stuart Reeves suggested that a common code of practice is formulated of Code of practice for sea trout including e.g. management of estuaries, shallow areas at sea like in Sweden in the Bothnian Bay, closed littoral zone like in Denmark; free water column above gillnets (2-3 m).

It was suggested by Johanna Karhu (HELCOM), that management recommendations should be formulated by HELCOM after member states had reported status to HELCOM.

Gerhard Martin (Germany) stressed that a possible general management plan should not be administratively heavy (referring to the present eel management plan) and supported possible plans to be based on local interest (bottom up).

Bjørn Barlaup (Norway) argued that the Norwegian experience with this type of issue was that it would not conflict, because local land owners and fishermen usually supported enhancements and

regulation projects for improving the stock status and consequently commit to the work and management decisions.
He added that it in Norway is important to set target levels allowing sustainable harvesting, i.e. fishing.

In the light of the obviously serious problems with by-catch of under sized sea trout especially around Finland and northern Sweden, a discussion on the issue of potential new regulation measures, potential effects on the other fisheries took place.

The different countries all have different experiences with creating closed areas and restricting the fishery.

In Finland there appears to be only three experiences with establishing closed areas near river mouths (Ingarskilanjoki, Vantaanjoki and Koskenkylänjoki). These were established after initiative from regional authorities, but actually carried out by third parties (private owner, local community or local organizations). They are all temporary (3-5 years) and based on volunteered agreements with local actors (private owners), and were accompanied with restoration projects in the rivers. They were all established with only little objections.

In Denmark there is a general closure around river mouths dating back at least to the 1930'ies. Suggestions for new or revised regulations usually arise from advice from experts, pointing out specific problems. Suggested changes are always through a hearing process, where it is the aim to keep a transparent process making available as much information as possible. The hearing process is considered to be an essential part of the process helping to improve local commitment to suggested regulations.
In general some regulations are revised regularly with 2-10 year intervals.

In Sweden several new regulations have been established recently or will be put into force in near future. Here the process always starts with public meetings. As an example when new regulations on use of gill-nets were decided upon in the northern Bothnian Bay (ICES Subdivision 31) public meetings were held along the coast one year before the expected implementation of the new regulations. It is considered to be important to have local understanding of the problems that need to be addressed, in order to motivate all relevant actors and wake the local interest. Proactive hearings/public meetings are seen essential in implementation of the new regulations
Regulations are usually permanent, but may be revised if needed.
In an area on the Swedish west coast four closed areas around river mouths have been expanded and now constitute a 30 km long closed area.

In Estonia it is common practice to have permanent local regulations, that usually are closed areas at the estuaries. These can be extended if necessary. It is considered to be important that motivation for the regulation has a biological basis, i.e. taking into consideration the requirements and characteristics of the fish species.

In Germany closed areas have been established. The usual procedure in includes discussions with the local actors being usually fishermen's associations and including both professional and recreational fishers. It is thought to be important that regulations are fair and transparent. In case of geographically adjacent fisheries, if professional fishermen have to stop fishing in some area it is necessary they are convinced that nobody else will harvest the same resource elsewhere (e.g. estuary vs. river fishery).

After discussions the meeting agreed on a set of statements (see page 3).

Literature

Heinimaa, P., Jutila, E. & Pakarinen, T. (eds.) 2007. *Baltic Sea Trout Workshop Kotka 31.5 - 2.6.2006, Kalatutkimuksia – Fiskundersökningar 410, 69 pp* (Helsinki, 2007).

HELCOM, 2011. Salmon and Sea Trout Populations and Rivers in the Baltic Sea – HELCOM assessment of salmon (*Salmo salar*) and sea trout (*Salmo trutta*) populations and habitats in rivers fl owing to the Baltic Sea. Balt. Sea Environ. Proc. No. 126A.

ICES 1987. Report of the Baltic Salmon and Trout Assessment Working Group, Copenhagen, 9-15 April 1987, C.M. 1987/Assess:21

ICES 1994. Report of the study group on anadromous trout. ICES C.M. 1994/M:4

ICES 1997. Report of the Baltic Salmon and Trout Assessment Working Group. ICES, Doc. C.M. 1997/Assess:11.

ICES 1999. Report of the Baltic Salmon and Trout Assessment Working Group (WGBAST),15-23 April 1999, ICES Headquarters, Copenhagen. 149 pp.

ICES 2007. Report of the Baltic Salmon and Trout Working Group (WGBAST), 11 - 20 April 2007, Vilnius, Lithuania. ICES CM 2007/ACFM:12. 250 pp.

ICES. 2008. Report of the Study Group on data requirements and assessment needs for Baltic Sea trout [SGBALANST], By Correspondence, December 2007 - February 2008. ICES CM 2008/DFC:01. 74 pp.

ICES. 2009. Report of the Study Group on Data Requirements and Assessment Needs for Baltic Sea Trout (SGBALANST), 3–5 February 2009, Copenhagen, Denmark. ICES CM 2009/DFC:03. 97 pp.

ICES. 2011. Study Group on data requirements and assessment needs for Baltic Sea trout (SGBALANST), 23 March 2010 St. Petersburg, Russia, By correspondence in 2011. ICES CM 2011/SSGEF:18. 54 pp.

Jutila, E., Saura, A., Kallio-Nyberg, I., Huhmarniemi, A. & Romakkaniemi, A. in *Sea Trout Biology, Conservation & Management, Proceedings of the First International Sea Trout Symposium, Cardiff, July 2004* (eds. Harris, G. & Milner, N.) 128-138 (520pp) (Blackwell Publishing, 2006)

Annex 1. Agenda

Day	Activity	Name	Item	Time
Tuesday 11 Oct.	Arrival			Morning
	Lunch			13:00
	Meeting	Chair: Tapani Pakarinen		14:00
		Stig Pedersen	Welcome, housekeeping, background and formalities	14:00
		Stig Pedersen	General overview and introduction	14:15
			National presentations	
		Erik Degerman	Status of Sea Trout populations in Sweden	14:45
		Eero Jutila	Status of Sea Trout populations in Finland	15:05
	Coffee			15:30
		Sergey Titov	Status of Sea Trout populations in Russia (incl. Kaliningrad area)	16:00
		Martin Kesler	Status of Sea Trout populations in Estonia	16:20
		Karpars Abersons	Status of Sea Trout populations in Latvia	16:40
		Stig Pedersen &	Rounding up day 1.	17:00
		Petri Heinimaa		
	Dinner			19:00
Wednesday 12. Oct	Meeting	Chair: Petri Heinimaa	National presentations - continued	09:00
		Vytautas Kesminas & Antenas Kontautas	Status of Sea Trout populations in Lithuania	09:05
		Piotr Debowski	Status of Sea Trout populations in Poland	09:25
		Harry Handtke	Status of Sea Trout populations in Germany	09:40
		Stig Pedersen	Status of Sea Trout populations in Denmark	10:00
		Tapani Pakarinen	Rounding up national presentations	10:20
	Coffee			10:30
	Meeting	Chair: Stig Pedersen & Petri Heinimaa		11:00
		Bjørn Barlaup	Norwegian perspective – status of sea trout populations in Norway, threats and possible management actions	11:00
			General discussion of status of sea trout populations	11:25
	Lunch			13:00
	Meeting	Chair: Stig Pedersen & Petri Heinimaa	Discussion of reasons for status of populations and possible actions to improve status in different parts of the Baltic Sea	14:00
	Coffee			15:30
	Meeting	Chair: Stig Pedersen & Petri Heinimaa	Final discussion - ways to improve sea trout status. Effect and possible effect on other fisheries.	16:00
		Stig Pedersen & Petri Heinimaa	Rounding up and conclusions, termination of official meeting	17:15
	Dinner			19:00
Thursday 13. Oct.	Excursion	Petri Heinimaa	Checking out and Excursion Vanhankaupunginkoski rapids and fishway in the mouth of Vantaanjoki -river Electrofishing activity at restored Longinoja (lowest trout brook in Vantaanjoki)	09:00
			Ruutinkoski rapids (lowest rapids in Vantaanjoki) and nature area	
			Drop-off at airport possible	13:00

Annex 2. List of participants

Name	Role	Institution	Country	Mail
Lene Scheel-Bech	Manager	The Danish AgriFish Agency, Ministry of Fisheries, Copenhagen	Denmark	lej@fd.dk
Stig Pedersen	National expert/ organisor	DTU Aqua, National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Silkeborg	Denmark	sp@aqua.dtu.dk
Herki Tuus	Manager	Ministry of the Environment, Talinn	Estonia	Herki.Tuus@envir.ee
Martin Kesler	National expert	Tartu University	Estonia	martin.kesler@ut.ee
Stuart Reeves	International stakeholder	EU Commision, DG MARE/E2	EU	Stuart.REEVES@ec.europa.eu
Mikko Koivurinta	Expert	Centre for Economic Development, Transport and the Environment of Uusimaa, Helsinki	Finland	mikko.koivurinta@ely-keskus.fi
Petri Heinima	Co organisor	Finnish Game and Fisheries Research, Helsinki	Finland	Petri.Heinimaa@rktl.fi
Tapani Pakarinen	Expert/co organisor	Finnish Game and Fisheries Research, Helsinki	Finland	Tapani.Pakarinen@rktl.fi
Eero Jutila	National expert	Finnish Game and Fisheries Research, Helsinki	Finland	Eero.Jutila@rktl.fi
Gerhard Martin	Manager	Fisheries Departement, Ministry of Agriculture, Environment and Consumer Protection	Germany	g.martin@lu.mv-regierung.de
Harry Handtke	National expert	Fisch and Environment, Rostock	Germany	harry@aquased.de
Johanna Karhu	International stakeholder	HELCOM, Helsinki	International	johanna.karhu@helcom.fi
Inese Mikelsone	Manager	Department of Fisheries, Ministry of Agriculture, Riga	Latvia	Inese.Mikelsone@zm.gov.lv
Karpars Abersons	National expert	Institute for Food Safety, Animal Health and Environment, Riga	Latvia	Kaspars.Abersons@bior.gov.lv
Antenas Kontautas	National expert	Coastal Research and Planning Institute, Klaipeda University	Lithuania	antanas@corpi.ku.lt
Povilas Paukštė	Manager	Nature Protection Departament, Ministry of Environment of the Republic of Lithuania, Vilnius	Lithuania	p.paukste@am.lt).
Vytautus Kesminas	National expert	Institute of Ecology, Vilnius University, Vinius	Lithuania	v.kesminas@takas.lt
Bjørn Barlaup	External expert	Laboratory of Freshwater Ecology and Inland Fisheries (LFI), Uni Environment, Bergen	Norway	Bjorn.Barlaup@uni.no
Igor Wawrzyniak	Manager	Inland Fisheries Unit, Department of Fisheries, Ministry of Agriculture and Rural Development, Warsaw	Poland	Igor.Wawrzyniak@minrol.gov.pl
Justyna Szumlicz	Manager	Ministry of Agriculture and Rural Development, Warsaw	Poland	Justyna.Szumlicz@minrol.gov.pl
Piotr Debowski	National expert	Inland Fisheries Institute, Gdansk	Poland	pdebow@infish.com.pl
Sergey Titov	National expert	State Research Institute on Lake and River Fisheries, Sct. Petersburg	Russia	sergtitov_54@mail.ru
Erik Degerman	National expert	Institute of Freshwater Research, Swedish University of Agricultural Sciences	Sweden	erik.degerman@slu.se
Martin Rydgren	Manager	The Swedish Agency for Marine and Water Management (SwAM)	Sweden	martin.rydgren@havochvatten.se

Annex 3. National presentations

Sweden
Status of sea trout stocks in the Swedish part of the Baltic Sea 1990-2010 assessed from recruitment data and spawner counts

Erik Degerman, Swedish University of Agricultural Sciences, Institute of Freshwater Research
2011-09-23

Summary

The status of the sea trout stocks has been assessed by the recruitment, i.e. number of parr, at 132 investigated sites in trout streams and river along the Baltic coast of Sweden. Only sites electrofished the period 1990 to 2010 were included.

In ICES Subdivision 23-25 (the Sound and southern Baltic) the abundance of parr had not changed over time. In Subdivision 27, 30 and 31 there were significant positive trends, but the parr abundance was considered low in subdivision 31.

Although these general trends in parr abundance, there were differences between years and rivers, demonstrating large annual fluctuations in small rivers. Whereas the general trend may be negative in a region some sites showed increased abundance, i.e. deviated from the general pattern. Sites with such improved abundance over time were generally those that had suboptimal habitat and were included in liming programmes.

In the HELCOM Salar project it was estimated that 1/3 of 309 sea trout streams in SWEDEN produced less than 50% of the potential smolt production.

Data on ascending spawners were available from a few rivers. In small sea trout rivers with stable populations with high abundance, the number of ascending spawners was one per 13-40 m^2 of available parr habitat, corresponding to 3-8 spawners per 100 m^2. In the larger salmon rivers no data on sea trout parr habitat is available, but the number of ascending spawners was generally lower than in small coastal sea trout streams and rivers, indicating that the sea trout populations in the larger salmon rivers in Subdivision 30 and 31 are very low.

Along with this catches of sea trout in river fishing in e.g. rivers Kalixälven and Torneälven have decreased substantially during the same period according to ICES.

Although comprehensive efforts have been made by river bed restoration, liming and fishing regulations the bad status of northern sea trout stocks prevail. The situation may be complex with many contributing factors. It is suggested that the cause must be identified for each river and appropriate actions undertaken as suggested by HELCOM in the SALAR programme.

A major problem that has been identified by ICES is the by-catch of trout in gill net fishing. Sweden has launched a ban on gill net fishing in shallow waters, where the sea trout is concentrated, during spring and autumn in subdivision 31. It is suggested that this is implemented in all subdivisions with declining sea trout stocks, perhaps even on an international level.

Introduction

Sea trout is the sea migrating form of brown trout (*Salmo trutta)*. The species is naturally distributed in North and Western Europe from the White Sea to Northern Spain, including the entire Baltic Sea area. Migration patterns are known for only a few Baltic populations. While it appears that most populations make relatively short feeding migrations (distances being a few hundred kilometres), it is known that all sea areas have populations with long migration patterns, spreading into neighbouring sea areas (ICES 2009).

The situation for sea trout in the Baltic area has been summarized by the ICES study group SGBALANST (2008, 2009, 2011) and by the HELCOM project SALAR (2011). It was concluded that the trout populations in the Bothnian Sea (ICES subdivision 30) and Bothnian Bay (ICES subdivision 31) and also in the Gulf of Finland (ICES subdivision 32) are in a bad state with very low parr densities and small runs of spawners into the rivers. In most other parts of the Baltic the trout populations seem to be in a reasonably good state, but there are differences within regions and approximately 100 out of 300 Swedish sea trout streams spread along the coast were classified as being below 50% of their potential production (HELCOM 2011).

ICES (2010) showed data on the swedish catch of sea trout in the fishery in River Kalixälven. The catch of sea trout 1969-1978 was between ca.1000-4500 kg, and in 2002-2009 it averaged ca 500 kg. The main reason for the poor status of the northern sea trout populations appears to be the by-catch of trout post smolts in a heavy coastal net fishery targeting mainly whitefish in the Bothnian Bay and Bothnian Sea area and also pikeperch in the Gulf of Finland (ICES 2009). The sea trout is only targeted directly by commercial fishing in the sea in the Main Basin, but is caught along the Swedish coast in the Bothnian Sea and Bothnian Bay in salmon traps. It is suggested by the SGBALANST (2009) that knowledge on catches in the non-commercial coastal fishery is essential and must be improved, possibly by inquiries supplemented with field observations or voluntary reporting.

Sea trout is monitored by all Baltic countries by electrofishing for parr in the natal streams, giving a good index measure of recruitment. Within a region there are often joint general trends in parr recruitment over time, but individual rivers may deviate due to local problems with the habitat, water chemistry, migration obstacles and local fishing pressure (ICES 2009). Canalizing of many rivers has lead to profound changes in riverbed structure, removal of the larger rocks and bank vegetation. Such degraded habitat generally results in reduced physical variation and uniform depth conditions that provides less hiding possibilities for the parr and therefore carrying capacity is decreased.

Swedish fishing regulation is generally focussed on salmon, not sea trout. However, the minimum size of sea trout was raised from 40 to 50 cm in Bothnian Bay in 2007 (ICES subdivision 31). Presently the minimum size is, therefore, 50 cm in the whole Swedish part of the Baltic Sea, except in the Bothnian Sea (ICES subdivision 30) where it remains 40 cm, i.e. well below the size of maturity. In the Main Basin (subdivisions 23–29), closed areas are frequent in the estuaries during the spawning migration. In the Bothnian Sea (30) and Bothnian Bay (31), normally only larger salmon rivers have closed areas. Instead all rivers and streams have an area of 200 meter radius from the mouth were fishing is prohibited during 1 September – 31 December. Fishing for sea trout and salmon is carried out in the rivers during the spawning run, but is prohibited during spawning (generally October-November). There is a general ban on net fishing in fresh water (rivers) where salmon and sea trout are present. A bag limit is seldom used in the national regulation of the fishery, but only one salmon per fisherman per day is allowed for rod and line fishing in northern salmon rivers. It has been suggested that this limit should also be applied to sea trout fishing in fresh waters because of the weakness of the stocks.

All stocked sea trout and salmon are fin-clipped, i.e. lacking the adipose fin. Although this allows for separating stocked fish from wild fish, it has not been used in fishing regulations.

The present study aims at a status description of sea trout stocks in Sweden 1990-2010 from rivers debouching in the Baltic Sea or the Sound. The focus is on recruitment, i.e. electrofishing data in the natal streams, but data on spawning runs are also presented.

Material & methods

This study focus on recruitment of trout parr quantified by electrofishing surveys of spawning beds and nursery areas in running waters. Parr is defined as young trout that have dispersed from the redd until the smolt stage (Allan & Ritter 1977), which would correspond to fish of 0+ to 2/4+ of age at the sampling in August/September. Recruitment of parr, i.e. the number of parr per unit of area, should be a function of ascending spawners (number of eggs) reaching the site, habitat quality and biotic interactions. It is thus essential to define boundaries for what a good parr habitat is, and what is not. The habitat includes both abiotic and biotic factors, which interact. SGBALANST (2011) defined classes of parr habitat quality from six environmental factors:

- stream wetted width
- slope of investigated section (estimated from maps)
- water velocity
- average/dominating depth
- dominating substratum
- shade.

Using these parameters according to SGBALANST (2011), all investigated sites have been classified into a habitat score from 0 to 12.

Part of the monitoring of sea trout parr takes place when monitoring salmon populations in the larger rivers. This will result in less precise estimates of sea trout recruitment, because of differences in habitat preferences of the two species, as sea trout dominates in smaller rivers and streams (Milner et al. 2007, SGBALANST 2008). In the present study only streams with a catchment area less than 1000 km^2 is included, unless otherwise stated.

From the Swedish electrofishing RegiSter (SERS) all electrofishing sites were selected that:

- held Baltic sea trout,
- the electrofishing had been carried out according to Swedish standards,

- and had been sampled at least ten times during 1990-2010,
- where the first sampling was carried out before 1996,
- and where the last sampling was carried out 2008-2010.

In total 132 sites from catchments <1000 km^2 were included in the data set (Table 1, Fig. 1). Out of these 22 sites were from tributaries of larger salmon rivers. An additional 134 sites from larger rivers, salmon rivers, were included for some analyses, i.e. sites with a catchment upstream larger than 1000 km^2. In the analyses data from ICES subdivision 23, 24, 25 & 27 were often handled together, i.e. the Sound, southern and south-eastern Sweden.

Table 1. Number of included sites per ICES subdivision. Sites in bold are from catchments <1000 km^2.

		Catchment area (km^2) upstream of site					
		<10	**<100**	**<1000**	*<10000*	*>10000*	Total
ICES	23	**1**	**7**	**4**	*1*	*0*	**12** *(1)*
	24	**1**	**2**	**3**	*0*	*0*	**6** *(0)*
	25	**1**	**1**	**2**	*10*	*0*	**4** *(10)*
	27	**1**	**8**	**3**	*5*	*0*	**12** *(5)*
	30	**13**	**35**	**8**	*31*	*6*	**56** *(37)*
	31	**4**	**19**	**19**	*69*	*12*	**42** *(81)*
Total		**21**	**72**	**39**	*116*	*18*	**132** *(134)*

Estimated abundance was calculated as individuals per 100 m^2 according to Bohlin et al. (1989) when several consecutive runs had been performed. If only a single run had been carried out abundance was estimated from fixed catch efficiencies according to Degerman & Sers (1999). Abundance was transformed using log10(x+1) to minimize variance and adjust to normal distribution. Abundance was also calculated as standardized abundance from transformed data according to:

Standardized abundance = Abundance an individual year – Average abundance of site

Using standardized abundances different sites with different habitat quality and egg deposition may be compared directly. The average standardized abundance is 0 and years with higher abundances will have higher (positive) values.

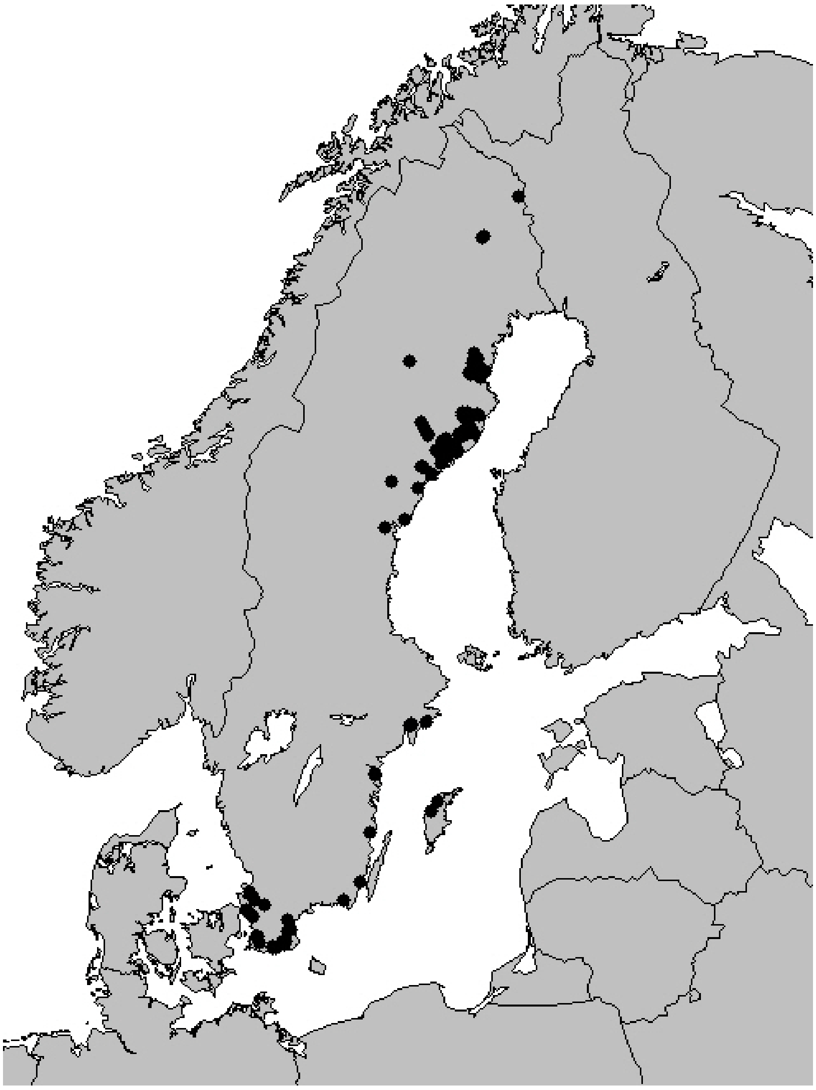


Fig. 1. Map of the Baltic Sea area with included electrofishing sites (sites with catchments <1000 km^2).

Results

Standardized abundance

The standardized abundance of the 132 sites (2158 fishing occasions) showed a significant increase over time (Fig. 2; linear regression, $F_{1,2156}$=93, p <0,001), but with low explained variation (r^2 adjusted = 0,04). Especially the period 2005-2010 the abundances were higher than average (Fig. 3).

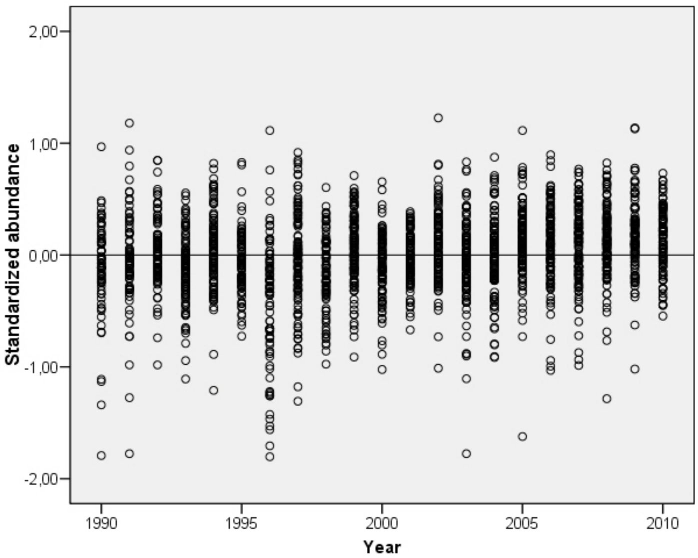


Fig. 2. Standardized abundance (log-transformed data) of sea trout parr (average and 95%-confidence interval) at 132 sites 1990-2010 in Baltic rivers (with a catchment area <1000 km^2).

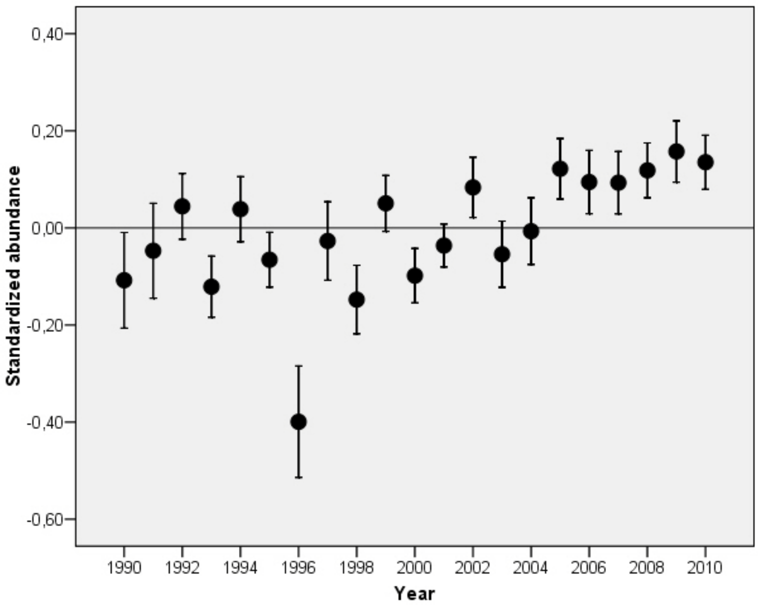


Fig. 3. Standardized abundance (log-transformed data) of sea trout parr (average and 95%-confidence interval) at 132 sites 1990-2010 in Baltic rivers (with a catchment area <1000 km^2). (Data as in Fig. 2, but expressed as yearly averages).

The standardized abundance was not correlated with year for the subset of data from ICES subdivision 23-25 (linear regression, $F_{1,328}$=1.3, p=0,24, r^2 adjusted = 0,001). However, there were fluctuations between years, e.g. with lower than average abundances in 2006 and 2007 (Fig. 4). There was a negative correlation between water level (three classes; low, intermediate, high) and the standardized abundance (Spearman rank correlation rho=0,156, n=321, p=0.005). Also, there was a significant positive correlation between water temperature and abundance (rho=-0,114, n=317, p=0.042), indicating that low water levels and high temperatures may positively impact recruitment in these subdivisions.

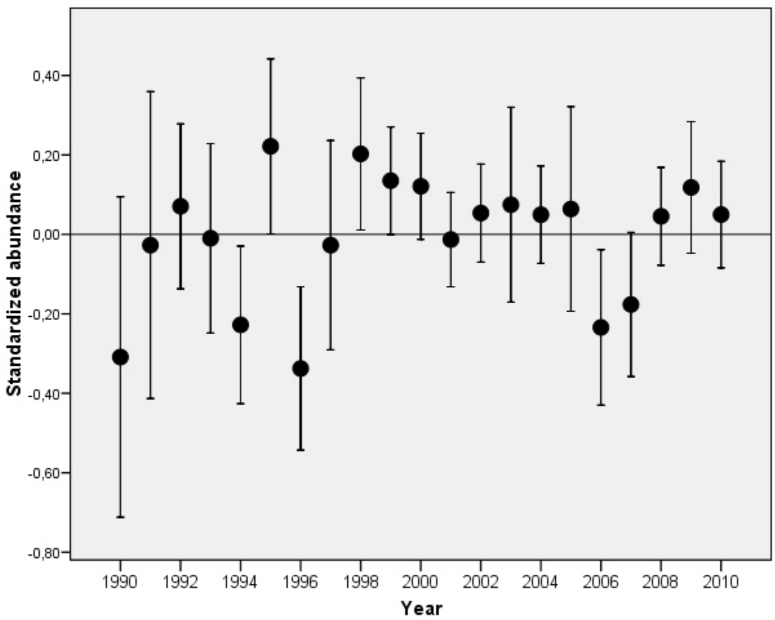


Fig. 4. Standardized abundance (log-transformed data) of sea trout parr (average and 95%-confidence interval) at 22 sites 1990-2010 in ICES subdivisions 23, 25 & 25

In ICES subdivision 27, the Swedish southeast coast, data was available from only 12 sites (Table 1). There was a weak trend (Fig. 5) of increasing standardized abundance over time (linear regression, $F_{1,163}$=5.7, p=0,018, r^2 adjusted = 0,028). No significant correlation between water temperature or water level and standardized abundance was found.

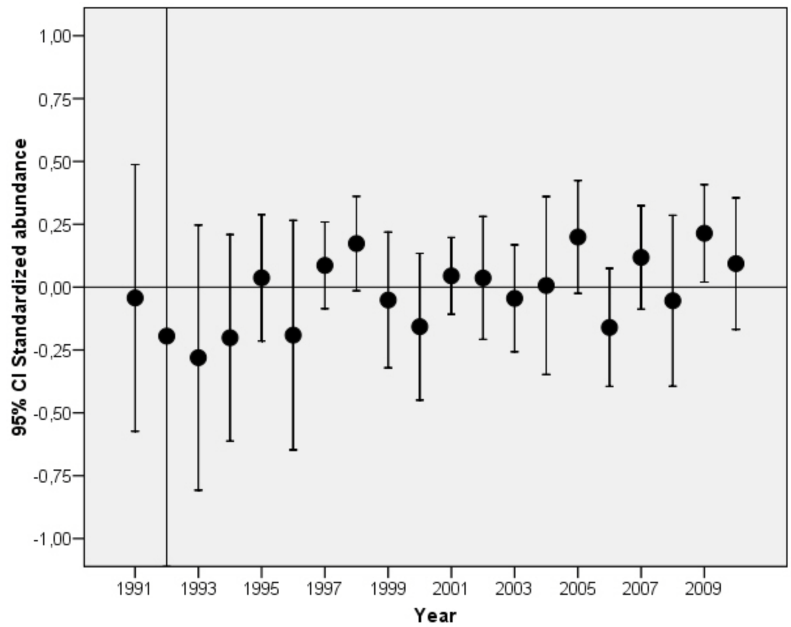


Fig. 5. Standardized abundance (log-transformed data) of sea trout parr (average and 95%-confidence interval) at 12 sites 1990-2010 in ICES subdivision 27

In the Bothnian Sea (ICES subdivision 30) there was a trend (Fig. 6) of increasing standardized abundance over time (linear regression, $F_{1,970}$=61.1, p<0,001, r^2 adjusted = 0,058). The abundance was especially low in 1996. This was due to a severe winter 1995/96 when several streams froze from surface to bottom (Hoffsten 2003).

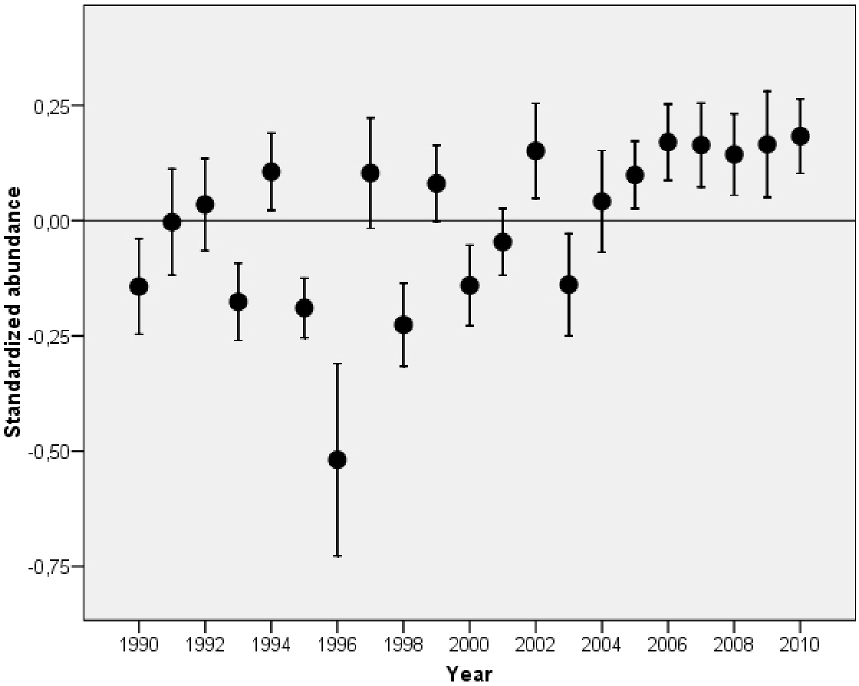


Fig. 6. Standardized abundance (log-transformed data) of sea trout parr (average and 95%-confidence interval) at 56 sites 1990-2010 in ICES subdivision 30 – Bothnian Sea.

There was a negative correlation between water level (three classes; low, intermediate, high) and the standardized abundance (Spearman rank correlation rho=0,257, n=934, p<0.001). Also, there was a significant positive correlation between water temperature and abundance (rho=-0,101, n=917, p=0.002), indicating that low water levels and high temperatures may positively impact recruitment in this subdivision.

In the Bothnian Bay (ICES subdivision 31) there was an interesting pattern in standardized abundance over time (Fig. 7). In the year 1996-1998 there were low abundances, whereas the years 2005-2010 showed higher than average abundances. In spite of this fluctuating pattern, there was a significant increase in standardized abundance over time (linear regression, $F_{1,689}$=38.1, p<0,001, r^2 adjusted = 0,051). As in subdivision 30 there was a negative correlation between water level (three classes; low, intermediate, high) and the standardized abundance (Spearman rank correlation rho=0,186, n=680, p<0,001). Also, there was a significant negative correlation between water velocity (three classes; slow, intermediate, fast) and abundance (rho=0,113, n=917, p=0,003), indicating that low water levels and velocities may positively impact recruitment in this subdivision. However, this may be due to that sampling is easier in low flow conditions in these rather large rivers.

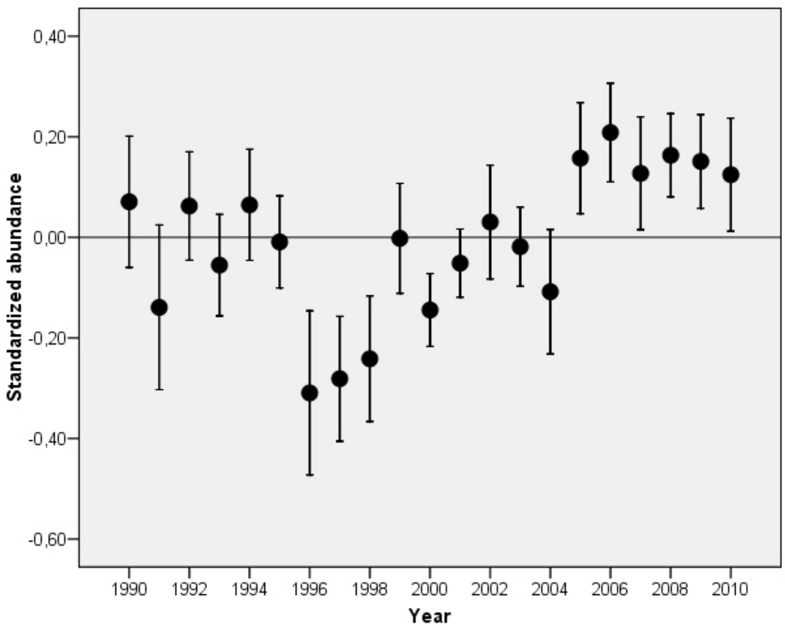


Fig. 7. Standardized abundance (log-transformed data) of sea trout parr (average and 95%-confidence interval) at 42 sites 1990-2010 in ICES subdivision 31 – Bothnian Bay.

Sites from larger rivers, i.e. salmon rivers, in Subdivisions 30 & 31 (n=118) had no significant trend in standardized abundance over time (Fig. 8). It should be noted that although averages fluctuated, the difference in average between years was small corresponding to circa 1,5 individuals per 100 m^2.

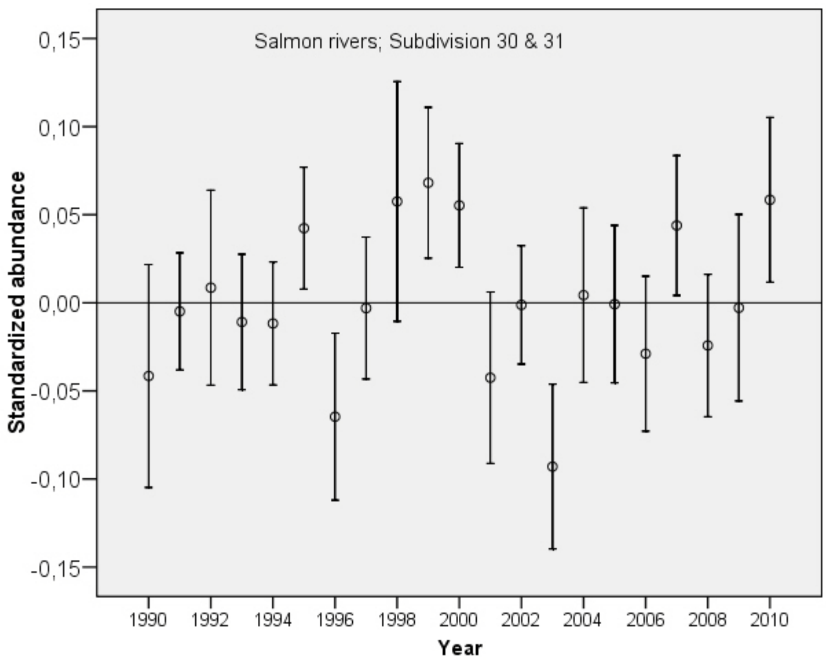


Fig. 8. Standardized abundance (log-transformed data) of sea trout parr (average and 95%-confidence interval) at 118 sites in larger (>1000 km^2) rivers in 1990-2010 in ICES subdivisions 30 & 31.

Abundance of trout

Comparing actual abundances of trout parr at different sites may be biased due to different habitat quality (Fig. 9). To enable comparisons habitat score was used. It could only be classified at 45,5% of electrofishing occasions due to lack of some environmental data, often shade (proportion of water surface shaded at noon). Using only sites with a habitat score of at least 9 (n=756) average abundance of trout was compared for the period 1990-1999 versus 2000-2010. In ICES subdivisions 23, 24, 25 & 27 the average abundance of trout was unaltered between 1990-1999 and the latter period (Fig. 10, One-way Anova $F_{1,223}$=0,88, p=0,348, n=225).

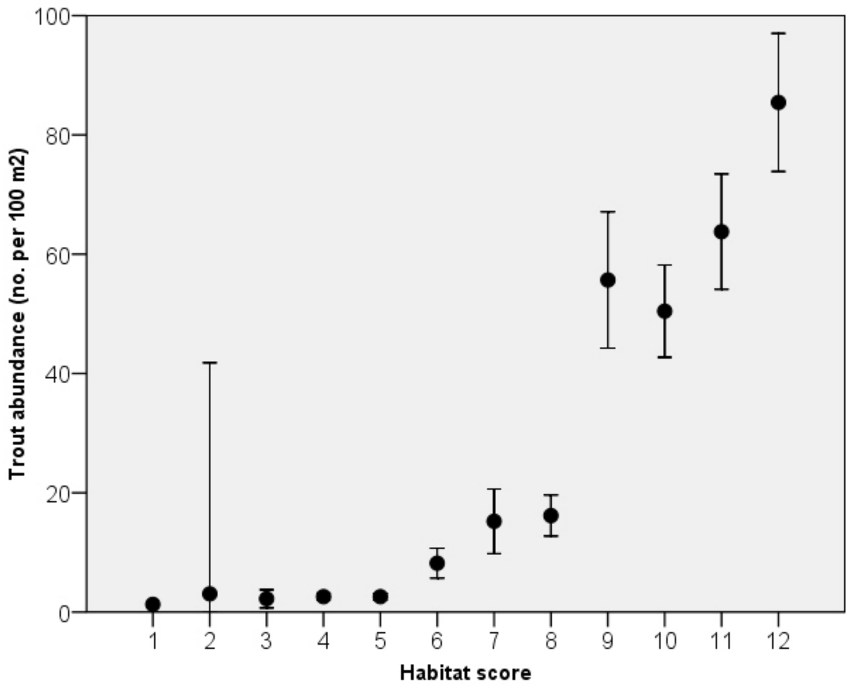


Fig. 9. Average abundance (and 95%-confidence interval) of sea trout parr at sites with different habitat score.

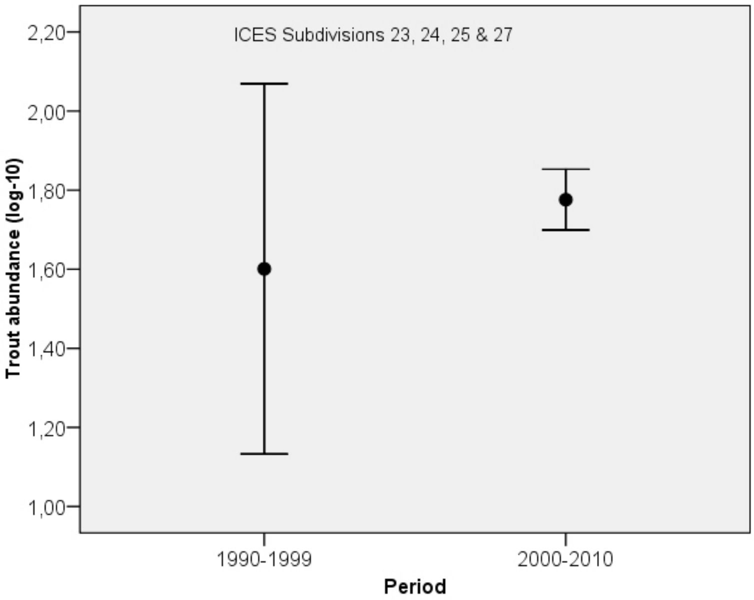


Fig. 10. Abundance (log-10; no. per 100 m^2) of sea trout parr (average and 95%-confidence interval) at sites with a habitat score of at least 9 the periods 1990-1999 and 2000-2010 in ICES subdivisions 23, 24, 25 & 27

In ICES subdivision 30 & 31 the average abundance of trout was higher 1990-1999 than in 2000-2010 (Fig. 11, One-way Anova $F_{1,529}$=3,73, p=0,05). Transforming the logged abundance back gives averages of 50,3 versus 24,7 trout parr per 100 m^2 for the periods, respectively, indicating a halved abundance the latter period.

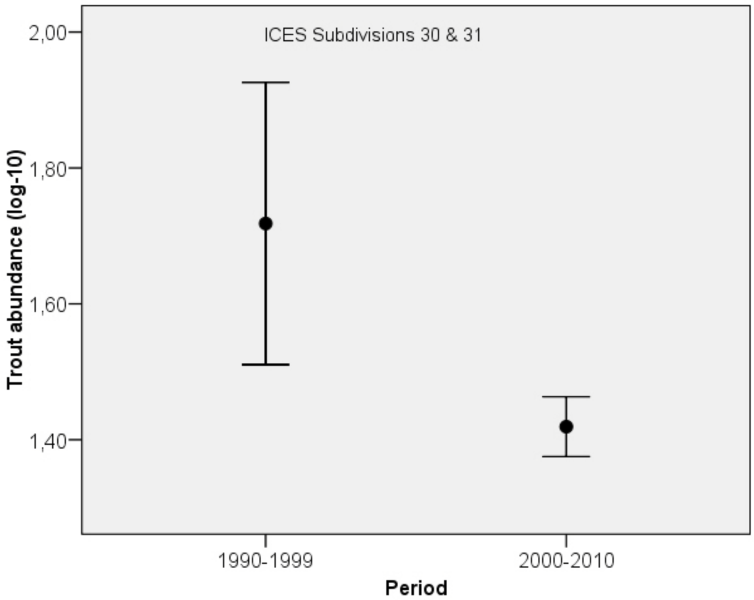


Fig. 11. Abundance (log-10; no. per 100 m^2) of sea trout parr (average and 95%-confidence interval) at sites with a habitat score of at least 9 the periods 1990-1999 and 2000-2010 in ICES subdivisions 30 & 31

Which sites had an increased parr abundance?

Parr abundance at all 132 sites was compared between 1990-1999 versus 2000-2001 using Mann-Whitney U-test. 27 sites had significant ($p<0,05$) increased parr abundance the latter period. These sites had on average been judged (subjectively by the field crew) as having less suitable trout parr habitat (scale 0-1-2) than the 105 sites with no significant increase in abundance (One-way Anova, $F_{1,130}=12,5$, $p=0,001$). Thus, significantly increased abundance was more common in less suitable trout habitat. However, the trout habitat score, which is a more objective measure of habitat quality, did not differ, being on average 9,2 and 8,8, respectively.

The average trout parr abundance was lower at sites with significantly increased abundance, as compared to the other sites (averages 28,9 and 52,3 parr per 100 m^2, One-way Anova, $F_{1,130}=3,86$, $p=0,049$), also indicating that increased abundance over time occurred at less suitable habitats.

There was a significant difference with respect to river bed restoration carried out. At sites with no increase in parr abundance river bed restoration projects were reported by the field crew at 4% of fishing occasions, whereas this proportion was only 1% at sites with increased abundance (Pearson Chi-2=15,2, df=1, $p<0,001$). However, liming operations were more common in streams with increased abundance; 76% of sites as opposed to 59% (Pearson Chi-2=43,3, df=1, $p<0,001$).

Number of ascending spawners and parr abundance

Ascending spawners of sea trout are mainly counted in the large salmon rivers. Five rivers in the ICES subdivisions 30 & 31 have automatic or manual counting. In general the number of ascending wild sea trout spawners were low, in three rivers below 100 individuals (Fig. 12), considerably lower than the amount needed for utilising available habitat. In three rivers (Kalixälven, Piteälven and Vindelälven) the number of ascending mature wild trout has increased significantly over time (Pearson correlation coefficient 0,88, 0,89 and 0,51, n=19, 21, 19 with $p<0,02$ for all). Especially in River Piteälven (average flow, MQ, 168 m^3/s) the increase was pronounced and was mainly due to closing of some salmon trap fishing in the estuary. Also in River Kalixälven (MQ 295 m^3/s) improved protected areas at the mouth may be contributing. Further, since 2006 net fishing in shallow water (0-3 m) is limited during spring and autumn in Bothnian Bay to avoid by-catch of sea trout.

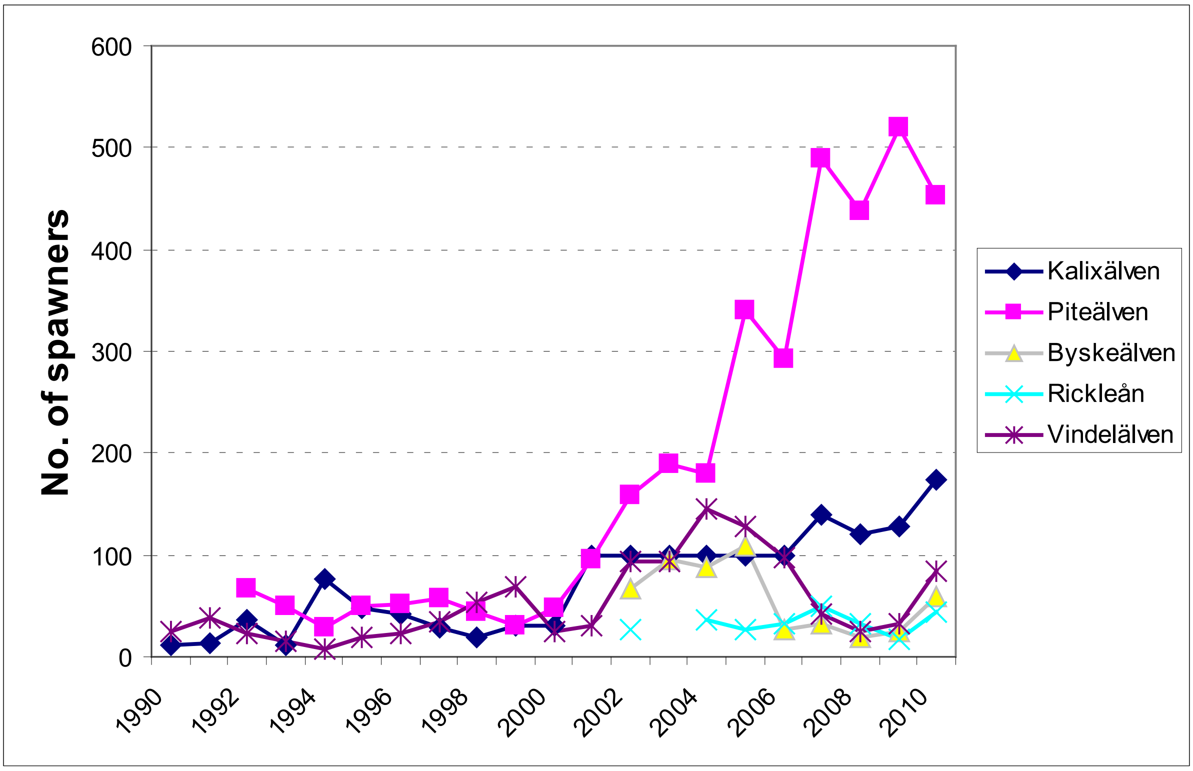


Fig. 12. Number of ascending wild sea trout for spawning in five large salmon rivers in Bothnian Sea and Bothnian Bay.

Sea trout parr are mainly confined to the river banks and generally in low abundance in these large salmon rivers. For the period 1990-2010 the average abundance was 4,3±10,6 (SD) per 100 m^2.

Counting of spawners in sea trout rivers, i.e. smaller rivers and streams, was rare. Scattered information was only available from River Selångersån (subdiv. 30, MQ 5,3), River Åvaån close to Stockholm (subdiv. 27, MQ <1), River Själsöån (subdiv. 27 at the Island of Gotland, MQ <0,5) and River Nybroån (subdiv. 24, MQ 3). From River Selångersån data was only available from 2005-2008, when an average of 268 sea trout was registered annually. This river is small as compared to the large salmon rivers displayed in Fig. 12, but the number of spawners was larger than in four out of five salmon rivers, indicating the low spawning population of sea trout in the larger rivers. Unfortunately, no estimate is available of the size of spawning area for sea trout in these larger rivers with their tributaries.

In the small River Själsöån (0,2 hectares of river bed) the average number of annual spawners in 1992-2007 was 77 individuals, indicating a very large spawning stock as compared to available habitat; one spawner per 26 m^2. As a consequence the average parr abundance has been high; 267±176 (SD) per 100 m^2.

In River Åvaån the number of ascending sea trout averaged 125 in 1998-2007. The total wetted area is 5000 m^2, with 4000 m^2 (0,4 hectares) being habitat for sea trout parr, i.e. a density of one spawner per 40 m^2. With this high spawning population in relation to the available habitat the number of parr has been high, with an average of 180±74,1 (SD) per 100 m^2. In River Åvaån also spawning redds

have been counted. On average 0,73 spawning redds was found per spawner. As the sex ratio is 50:50, this would amount to 1,46 spawning redds per female.
In the River Nybroån data on spawners was available from 1974 to 2005. On average the period 1990-2005 4571 spawners ascended the river each year. The available spawning and nursery habitat is 6 hectares, i.e. the spawner density averaged one per 13 m^2. The average parr density 1990-2010 was 49,1±29 (SD) per 100 m^2.

Discussion

Sweden has a long coast with hundreds of sea trout streams. In general, the stocks are in a good state in the Baltic Main Basin and on the Swedish west coast (Kattegat & Skagerrak, Fiskeriverket 2011). Investigations of parr densities (recruitment) have shown that these stocks have been stable during the last decade in these regions (op. cit., this report). In the Bothnian Bay, stocks are threatened by overfishing (Lundqvist et al. 2007, ICES 2010), and trout is mainly caught as by-catch in net fishing aimed at whitefish or perch (Petersson et al. 2009). In the Bothnian Sea the status of the stocks is better than in the Bothnian Bay, but not as good as in southern Sweden.

As the sea trout streams are rather small they are more affected by climatic variations, than are the larger salmon rivers. This was evident in subdivisions 30 & 31 where the winter 1995/96 was cold, and precipitation (snowfall), was extremely low (Hoffsten 2003). The combined effects of low temperature and thin snow-cover resulted in bottom-freezing in smaller streams (op. cit.). As a result abundance of trout parr was low the following summers.

These smaller water bodies are thus less stable than larger rivers, as shown by the effects of the cold winter 1995/96 and the effects of water temperature and water level at sampling on the number of parr. Therefore fishery management actions may take longer time to show effect. The ban on net fishing in shallow coastal waters implemented in 2006 in the Bothnian Bay has not shown any significant positive effects, but parr densities are higher now than previous periods in the sea trout rivers (Fig. 7). It is suggested that continued monitoring of stocks for at least two sea trout generations (ca. 12 years) may be required before a final evaluation.

Although the available spawning and rearing areas for sea trout are not quantified in the large salmon rivers it was evident that the number of spawners ascending was well below what is required for maximum production. In these smaller sea trout rivers presented, the number of spawners has been one per 13-40 m^2 of available parr habitat. It may be that these numbers of spawners are well above what is required for optimum production. Alm (1950) working with River Åvaån found that the highest smoltproduction was achieved when 50 eggs were deposited per square meter. Females in the river averaged 2 kg and holds 3200 eggs (op. cit.)
With an equal amount of males and females in the spawning run, the average run 1998-2007 would have carried ca 200 000 eggs. The average egg deposition this period would then be 50/m^2. Interestingly, Elliott (1994) found the same figure to be the optimum egg deposition in Black Brows Beck, England.

Data on smolt production from River Åvaån indicates that it has been of similar size in the 1920:s (Alm 1950) and today (pers. comm. Fisheries officer Henrik C. Andersson). The reason such a small population has been seemingly stable may be that the small spawning run has not attracted local fishing. In the larger rivers, with larger spawning runs fishing is more profitable. As a consequence fishing pressure may be higher on larger stocks. This could be part of the large discrepancies today between the number of sea trout spawners per suitable habitat area in large salmon rivers and smaller sea trout rivers.

It is suggested that the large coastal fishery for salmon in the areas surrounding the large salmon river mouths also affects sea trout. This view is strengthened by the fact that the number of sea trout spawners increased in salmon rivers where the number of trap nets decreased or where the closed area at the mouth was increased. Salmon fishing may therefore be a threat to sea trout, but fishing regulations aimed at salmon may be beneficial. As sea trout stocks still are extremely low it should be considered if further actions can be undertaken aiming specifically at sea trout protection. In this study the only positive effects on stock status were in larger salmon rivers (increased number of spawners; Fig. 12), as a possible consequence of fishing regulation for salmon. The same attention must be given to all the small sea trout rivers.

All stocked sea trout and salmon in Sweden are fin-clipped, i.e. without the adipose fin. This allows for a ban on landing wild sea trout in the salmon fishery with trap nets. Until sea trout stocks have recovered this is a recommended action. A confounding factor is that stocked sea trout in Finland is not fin-clipped and will therefore not be harvested in Swedish waters, even if the trout are of legal size. This is of minor importance, as compared to restoring wild stocks, but fin-clipping at least of sea trout in Finland would be welcome.

As a consequence of a ban on landing wild trout, gill net fishing for sea trout should not be allowed in the coastal zone as caught wild fish cannot be released alive. Rod and line and salmon traps are better gear from the sea trout management perspective. Petersson et al. (2009) estimated that 243 ton (316 000 trout) of sea trout was caught in 2007 as a by-catch in coastal gill net fishing aimed at whitefish (*Coregonus lavaretus*) in the Bothnian Bay and Bothnian Sea in Sweden.

The counting of spawners in sea trout rivers are run by regional agencies, and focussed on important sea trout populations. This means that the focus is on productive populations of regional importance. This will result in an overrepresentation of stable and high producing stocks in the data set. This may explain a discrepancy between parr data and the spawner count data.

Although, the general trends found are valid for many streams there are locally some streams showing deviating trends in recruitment, often due to local habitat, stream connectivity or fishing at the mouth. Hence, in order to detect general trends several streams are required.

The standardized abundance was negatively correlated to high water temperatures and low flow at sampling in several regions. Water withdrawal and a lowered water table due to ditching or lowering of lakes may be a crucial factor for sea trout stocks. Sea trout populations, living in smaller streams, require more attention to water quality and water quantity than do salmon stocks in the larger rivers. Fishery management measures for sea trout should therefore be undertaken with parallel actions to address environmental problems in the freshwater habitat and connectivity as suggested by HELCOM (2011).

The study showed that significantly improved parr abundance was achieved primarily in less suitable sea trout parr habitats, with lower abundance of parr than in sites without a significant increase over time. Surprisingly, theses sites were less subjected to river bed restoration projects, but on the other hand liming programmed were more frequent. This indicates that monitoring of the best habitats may be insensitive to population changes as these habitats may have relatively high abundance even when the stock number is low. It could also be added that the coefficient of variation (standard deviation/mean) was negatively correlated to habitat score (Pearson correlation, $r=-0,33$, $p<0,01$, $n=132$), indicating the need for more samples in less suitable habitats. Monitoring should therefore be undertaken in areas of different habitat quality, in order to both see maximum parr densities at optimum habitats as well as population utilization of habitats of lower quality.

In conclusion, sea trout populations vary within regions and between years more than do salmon populations, but general trends were evident. These trends show a positive development in Bothnian Bay and B. Sea and more stable development in southern Sweden. A positive development was present for the spawning run in some salmon rivers as a consequence of fishery management actions for salmon, not specifically for sea trout.
The need for further protective measures are evident, both in the freshwater environment as such and in the fishery.

References

Allan, I.R.H. & J.A. Ritter, 1977. Salmonid terminology. Journal du Conseil international pour l'Exploration de la Mer 37: 293–299.

Alm, G. 1950. The sea-trout population in the Åva stream. Rep. Inst. Freshw. Res. Drottningholm 31:26-56.

Bohlin, T., Hamrin, S., Heggberget, T.G., Rasmussen, G. & S.J. Saltveit, 1989. Electrofishing - theory and practice with special emphasis on salmonids. Hydrobiologia 173:9-43.

Degerman, E. & B. Sers, 1999. Elfiske. Standardiserat elfiske och praktiska tips med betoning på säkerhet såväl för fisk som fiskare (Electrofishing - Swedish code of practice). Fiskeriverket Information 1999:3, 69 s. (In Swedish)

Elliott, J.M. 1994. Quantitative ecology and the brown trout. Oxford Univ. Press, 286 s.

Fiskeriverket, 2011. Resurs- och miljööversikt 2011 (Stock and environmental status in 2011). Fiskeriverket, 247 p. (In Swedish)

HELCOM, 2011. Salmon and sea trout populations and rivers in the Baltic Sea – HELCOM assessment of salmon (*Salmo salar*) and sea trout (*Salmo trutta*) populations and habitats in rivers flowing to the Baltic Sea. Baltic Sea Environment Proceedings no. 126A, 79 p.

Hoffsten, P.-O., 2003. Effects of an extraordinarily harsh winter on macroinvertebrates and fish in boreal streams. Arch. Hydrobiol. 157(4):505–523.

ICES. 2008. Report of the study group on data requirements and assessment needs for Baltic trout (SGBALANST). ICES CM 2008/DFC:01, 74 p.

ICES. 2009. Report of the study group on data requirements and assessment needs for Baltic trout (SGBALANST). ICES CM 2009/DFC:03, 97 p.

ICES, 2010. Report on the working group on Baltic salmon and sea trout (WGBAST). ICES CM 2010: ACOM 8, 253 p.

ICES. 2011. Study Group on data requirements and assessment needs for Baltic Sea trout (SGBALANST), 23 March 2010 St. Petersburg, Russia, by correspondence in 2011. ICES CM 2011/SSGEF:18. 54 pp.

Lundqvist, H., McKinnell, S.M., Jonsson, S. & J. Östergren, 2007. Is stocking with sea trout compatible with the conservation of wild trout (*Salmo trutta* L.)? In: Sea Trout: Biology, Conservation & Management. pp. 356-371. Blackwell Publishing Ltd, Oxford.

Milner, N.J., Karlsson, L., Degerman, E., Johlander, A., MacClean, L.P., Hansen, L-P. 2007. Sea Trout (*Salmo trutta* L.) in European Salmon (*Salmo salar* L.) Rivers. In: Sea Trout: Biology, Conservation & Management. pp. 139-156. Blackwell Publishing Ltd, Oxford.

Petersson, E., Aho, T., and Asp, A. 2009. Fritidsfiskets nätfångster av öring i Bottenhavet och Bottenviken, Fiskeriverket, Sweden (Non-commercial catch of sea trout in the Bothnian sea and Bothnian Bay - an estimate).17 pp. (In Swedish).

Finland

Finnish country report 2011 - Status of sea trout populations in Finland

Eero Jutila, Tapani Pakarinen, Ari Saura, Ville Vähä & Alpo Huhmarniemi
Finnish Game and Fisheries Research Institute

In Finland there are altogether 11 probably original wild Baltic sea trout populations left, two in the Bothnian Bay, one in the Bothnian Sea, six in the Gulf of Finland and two rivers flowing into the Gulf of Finland in the Russian territory (Fig. 1). Most sea trout populations in the Gulf of Finland area live in small rivers or tributaries. Two probably original populations have been identified a few years ago. In addition, one stock is maintained only as a hatchery stock. There are also several former or potential sea trout rivers, which would require considerable improvements in water quality, habitats and/or fishing regulation as well as restocking to be suitable for the rehabilitation of sea trout populations.

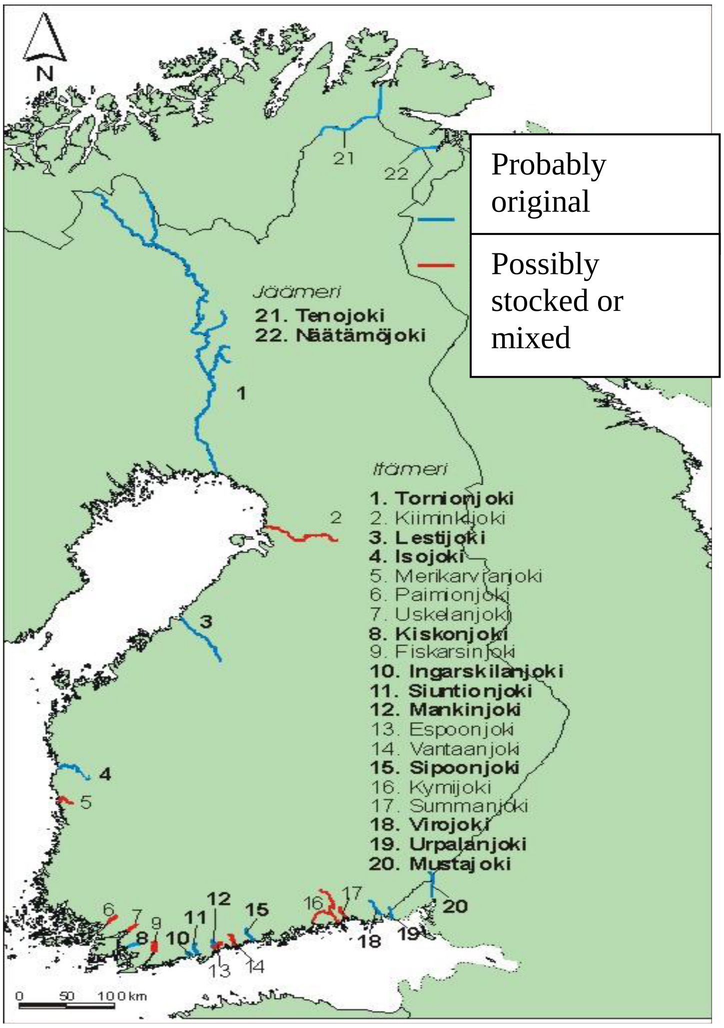


Fig. 1. Finnish stocks of Baltic sea trout

The status of these stocks has been monitored by electrofishing. The density of 0+ parr varies from river to river and the annual values are very labile in all rivers. During past five years, the 0+ density has increased in the Äkäsjoki and decreased in the Pakajoki in the Tornionjoki river system (Fig. 2). In the southern Bothnian Bay area, wild 0+ parr have been found only occasionally in the Lestijoki river and densities have been <1 parr/100 m^2. The parr density in the Isojoki river, the Bothnian Sea area, was higher than average in 2008-2009, but has decreased to a low level again (Fig. 3). Parr densities have been highest in the Ingarskila river, the Gulf of Finland area, at the maximum more than 80 parr/100 m^2 in 2009, but the annual variations are large (Fig. 4). Natural reproduction exists also in some other rivers, but they have not been monitored every year. In these rivers the observed mean densities have commonly been low, <5 parr/100 m^2. In general the parr densities are far below the potential production level due to the low number of spawners in the rivers, which result in severe risks both for the survival of the natural stocks and for the maintenance of the hatchery brood stocks. In “The 2010 Red List of Finnish species” all wild sea trout populations were assessed to the class Critically Endangered (Cr).

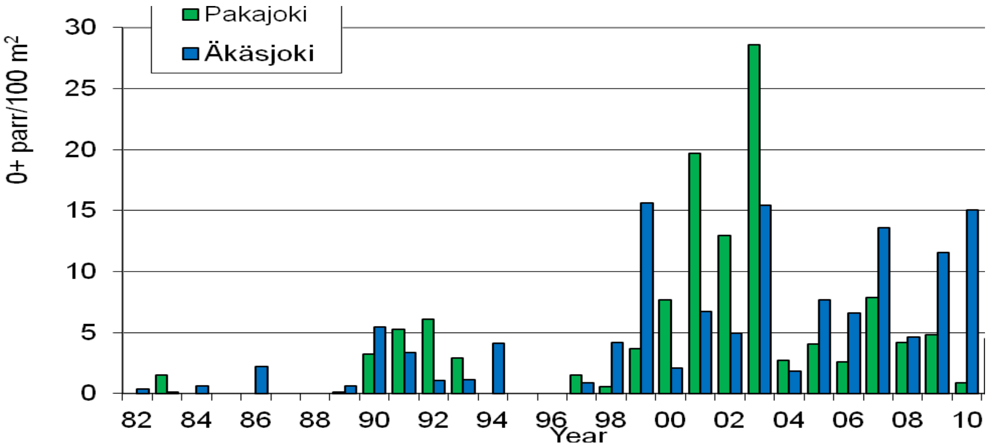


Fig. 2. Density of 0+ parr in two tributaries of the Tornionjoki river, Bothnian Bay. No electrofishing was carried out in the tributaries in 1985. The number of sampling sites was increased in 1998. This erodes the comparability of the results of 1998-2006 with the earlier years’ result.

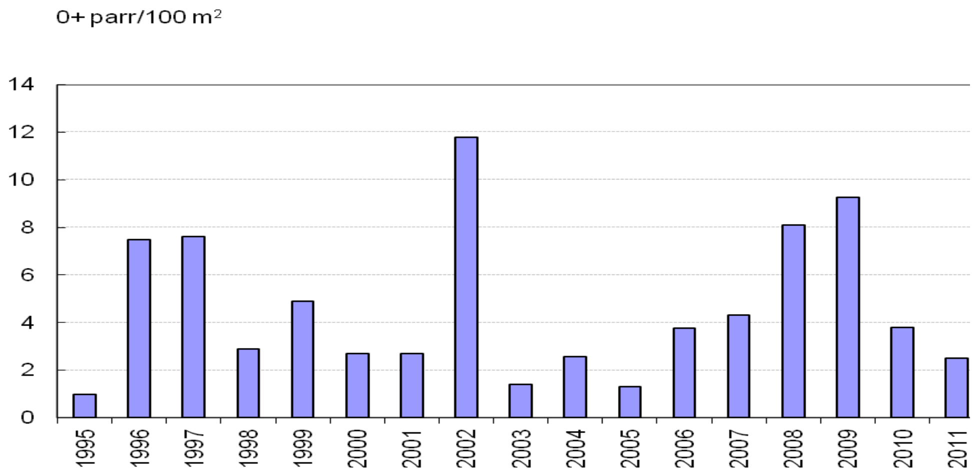


Fig. 3. Density of 0+ parr in the Isojoki river, Bothnian Sea.

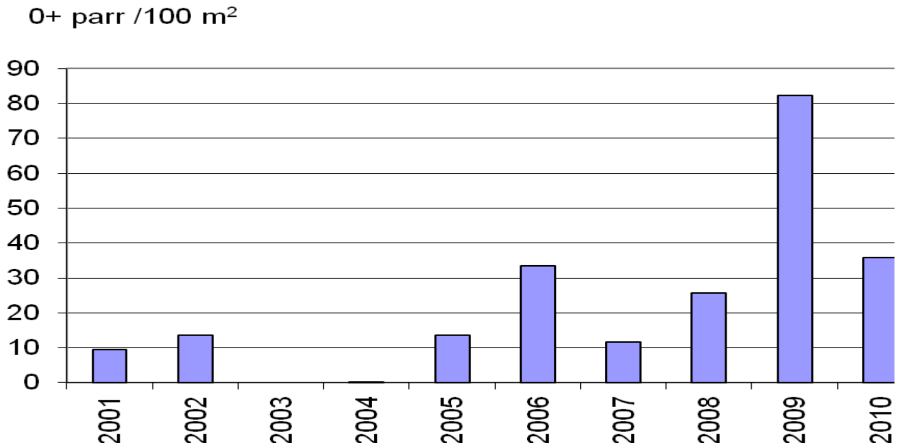


Fig. 4. Density of 0+ parr in the Ingarskila river, Gulf of Finland.

Tagging results

Recapture rate and yield

In the Finnish Carlin tagging experiments, there is a strong decreasing trend in the recapture rate and yield since the 1980s (Fig. 5). The recapture rate was at the highest in the 1980s over 10% in all sea areas and the yield more than 400 kg/1 000 smolts in the Archipelago Sea and in the Gulf of Finland, and over 250 kg and 100 kg/1 000 smolts in the Bothnian Sea and Bothnian Bay, respectively. Since year 2000 the decreasing trend has still continued and the tagging results are nowadays rather similar in all sea areas. In tagging experiments in years 2000-2004, the yield was <100 kg/1 000 smolts, and since 2005 less than 50 kg/1 000 smolts. In the early 2000s the recapture rate was < 7%, and since 2005 it has been less than 3%.

Age at recapture

According to Finnish tagging data, the age at recapture is lowest in the Bothnian Bay, where mostly over 50% of the recoveries come from fish caught during the releasing year (Fig. 6). Annual variations are large in all sea areas. The proportion of 0 SW fish has increased also in other sea areas especially in the 2000s, varying from year to year within a range of around 25% and 75%. 1 SW fish is the secondly common group, and fish older than 1 SW constitute mainly only 10-25% of the recoveries.

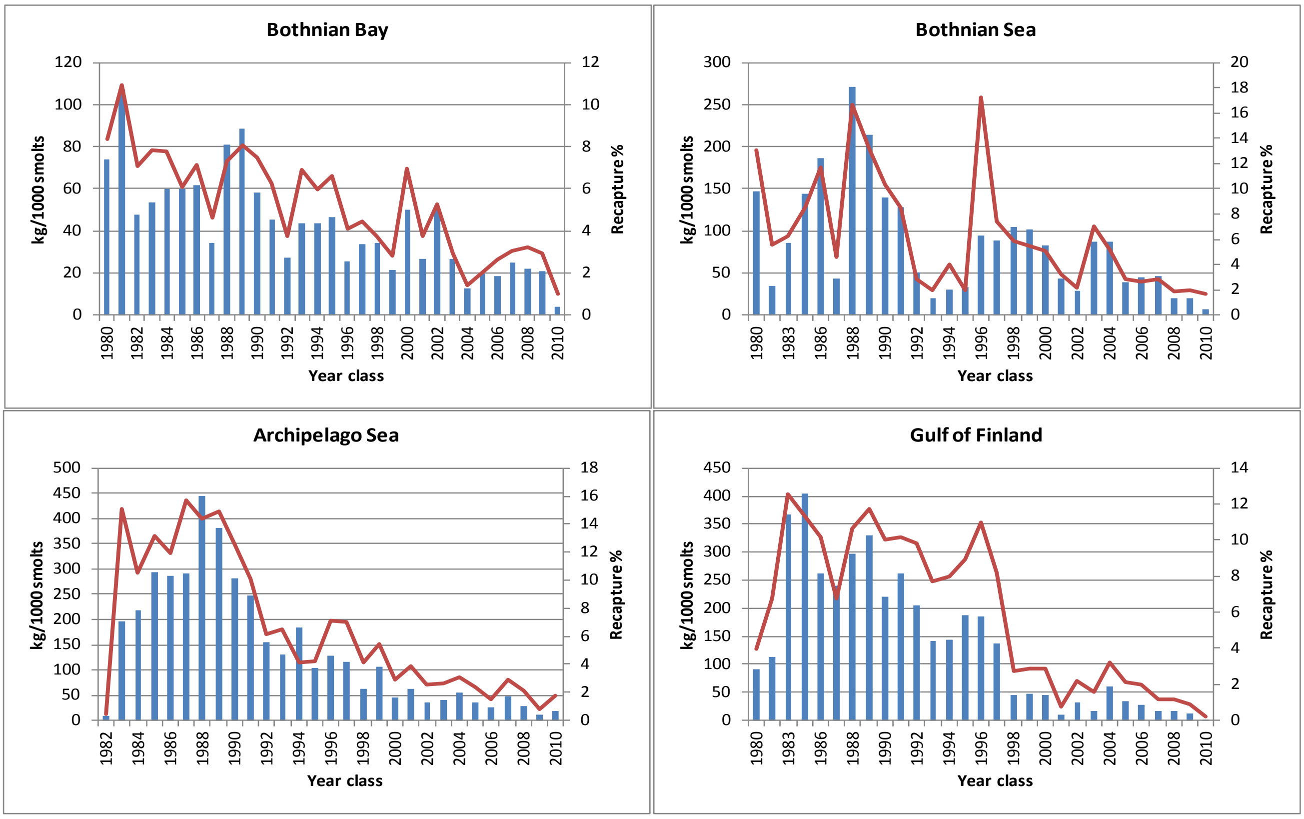


Fig. 5. Recapture rate and yield/1000 smolts in Finnish releases of Carlin tagged sea trout smolts in the Baltic Sea (ICES 29-32).

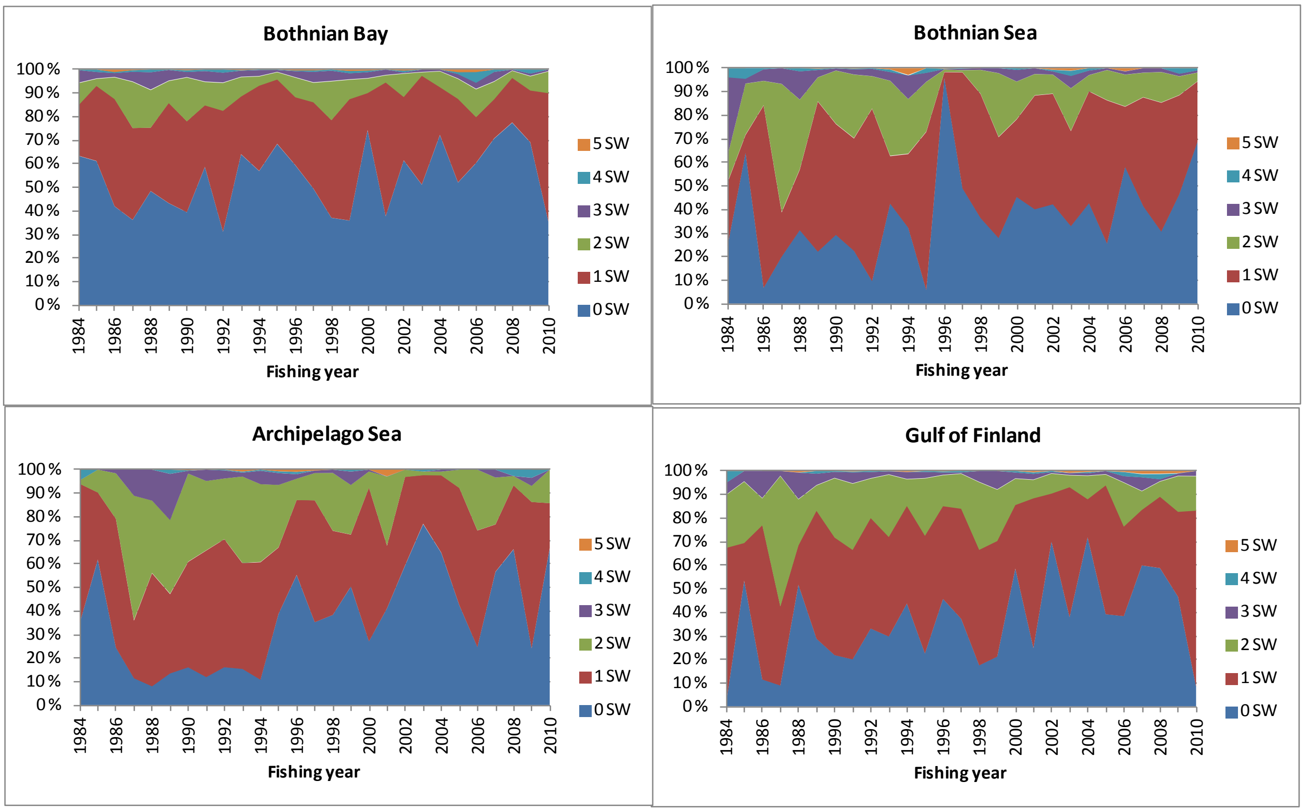


Fig. 6. Recoveries by sea age in Finnish tagging experiments in the Baltic Sea (ICES 29-32).

Recaptures by fishing gear

On the basis of the Finnish tagging experiments a great majority, mostly 50-80% of the recoveries come from fishing with bottom gill nets (Fig. 7). Sea trout are commonly caught as by-catch in gill net and fyke net fishing for other species, mainly whitefish, pikeperch and perch. In the recapture data, the proportion of bottom gill nets has traditionally been highest in the Gulf of Bothnia, but it has now continuously increased in other sea areas, too. After the gill nets, fyke nets are the secondly common fishing gear in the Bothnian Bay constituting about 20% of the recoveries. In the Bothnian Sea, the proportion of both fyke nets and surface gill nets has been around 10% each, respectively. The proportion of rod fishing has since 1990s been highest (10-30%) in the southern sea areas Archipelago Sea and in the Gulf of Finland, where the total share of fyke nets and surface gill nets has been less than 10%.

Size at recapture

In the Gulf of Bothnia, over half of the recoveries of tagged sea trout constitute of fish less than 40 cm (Fig. 8). In the 2000s, the share of <40 cm fish has continuously been over 50% in the Bothnian Bay and around 40-50% in the Bothnian Sea. In the Archipelago Sea the proportion of <40 cm fish has with some exceptions been around 30%, while in the Gulf of Finland it has increased rapidly since 2000 from 30% to over 50%, but dropped in 2009 again to around the earlier level. The next abundant fish size groups is 40-50 cm. Their share varied commonly between 10 and 40%. Fish <50 cm have constituted in the 2000s 50-80% of the recoveries in all other sea areas except in the Bothnian Bay, where their proportion was at the highest near 90%. Thus 10-20% of the recoveries came from fish longer than 50 cm in the Bothnian Bay and about 30%, respectively, in the Bothnian Sea. In the Archipelago Sea and in the Gulf of Finland their proportion has varied annually between around 20 and 50%. Most sea trout females mature and may spawn if they reach the size of 65 cm.

Proportion of sea and river recaptures

The Finnish Carlin tagging data show, that if the recoveries of sea trout recovered as post smolts are omitted, the proportion of fish caught in the river fishery is 4% in the Bothnian Bay and 6% in the other sea areas (Fig. 9). This indicates high fishing pressure and reproduction overfishing in all the sea areas, which result in severe risk of extinction for the natural sea trout stocks.

Yield per recruit

The earlier calculations based on the Finnish Carlin-tagging data 1980-2000 indicated that the annual harvest rate was about 70-80% in the Bothnian Bay and also in other sea areas. The optimal yield could be obtained with the annual harvest rate of 30%. It has been calculated that using gill nets with larger mesh sizes (>50 mm) would postpone the recruitment to fishery by one or two years and result in at least twofold increase in annual catches.

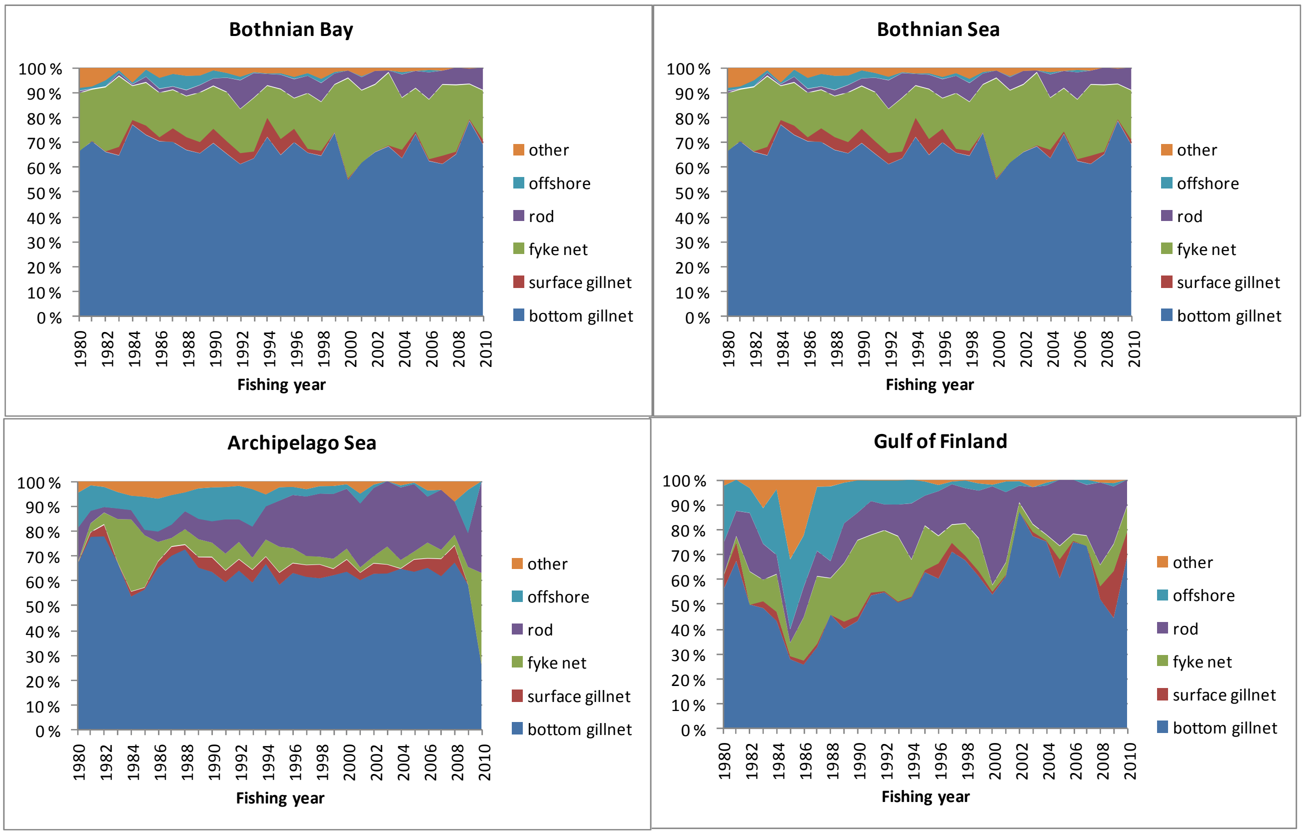


Fig. 7. Tag recoveries by fishing gear in Finnish experiments in the Baltic Sea (ICES 29-32).

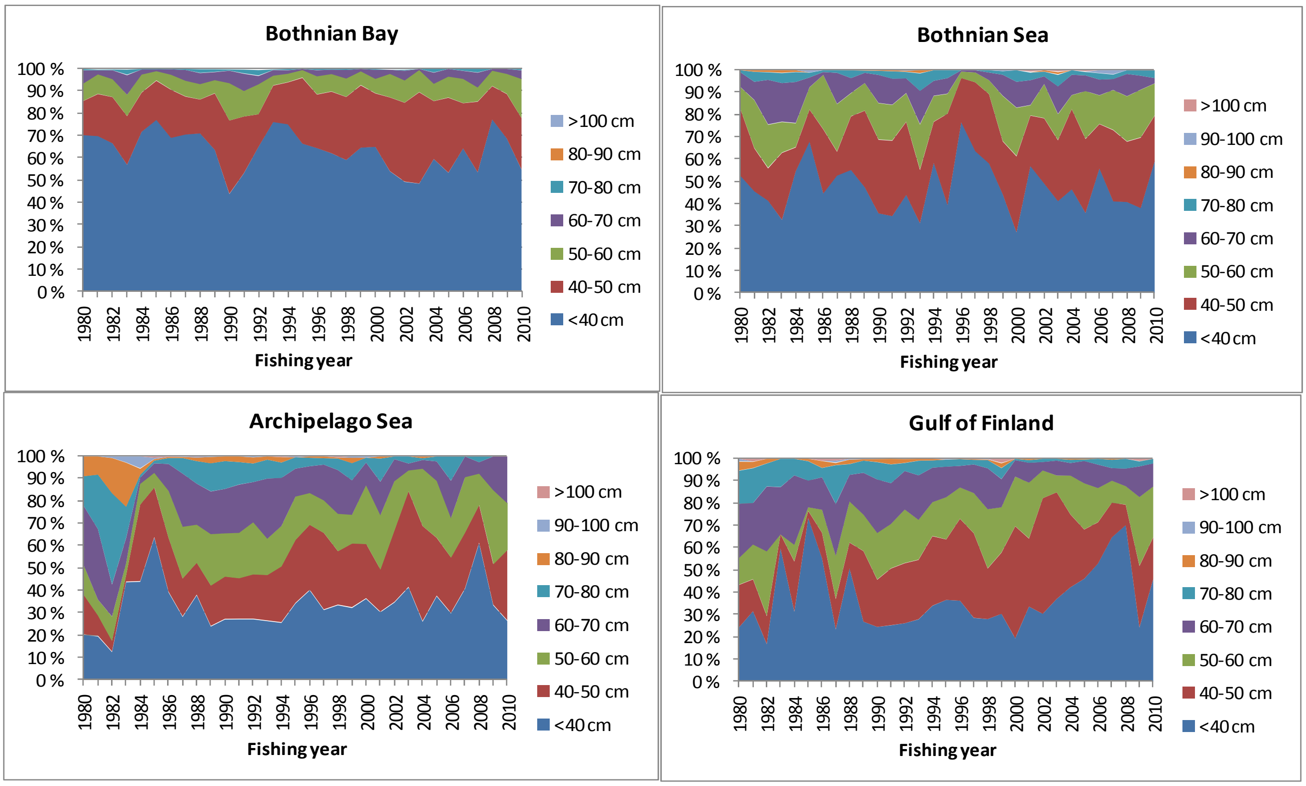


Fig. 8. Tag recoveries by length group in Finnish experiments in the Baltic Sea (ICES 29-32).

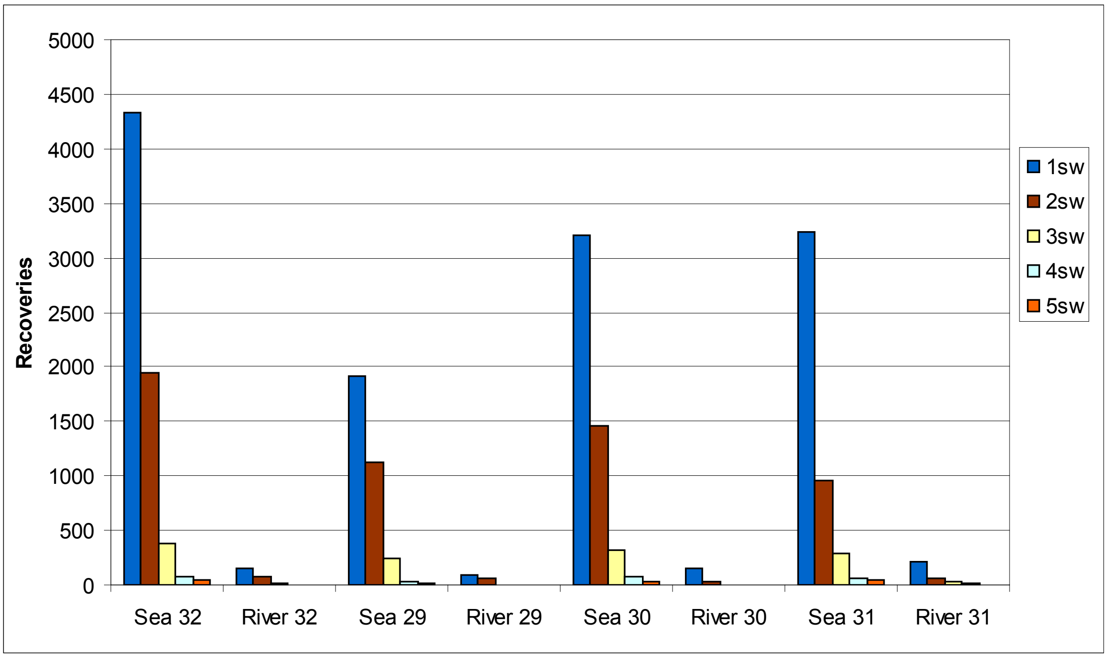


Fig. 9. Distribution of all tag recoveries between sea and river in the ICES Subdivisions 29-32 based on Finnish Carlin-taggings since the 1980s, 0 SW fish omitted. Proportions of river catches: ICES 29 = 4%, ICES 30 = 4%, ICES 31 = 6%, ICES 32 = 4%.

Migration patterns

In Finland, tagging experiments with reared sea trout smolts in different sea areas show, that sea trout migrate in the sea mainly rather short distances, mostly <100 km from their releasing site (Figs 10-11). Even though almost all recaptures come from the Finnish coast, some of them may also come from the same sea area from the neighbor countries.

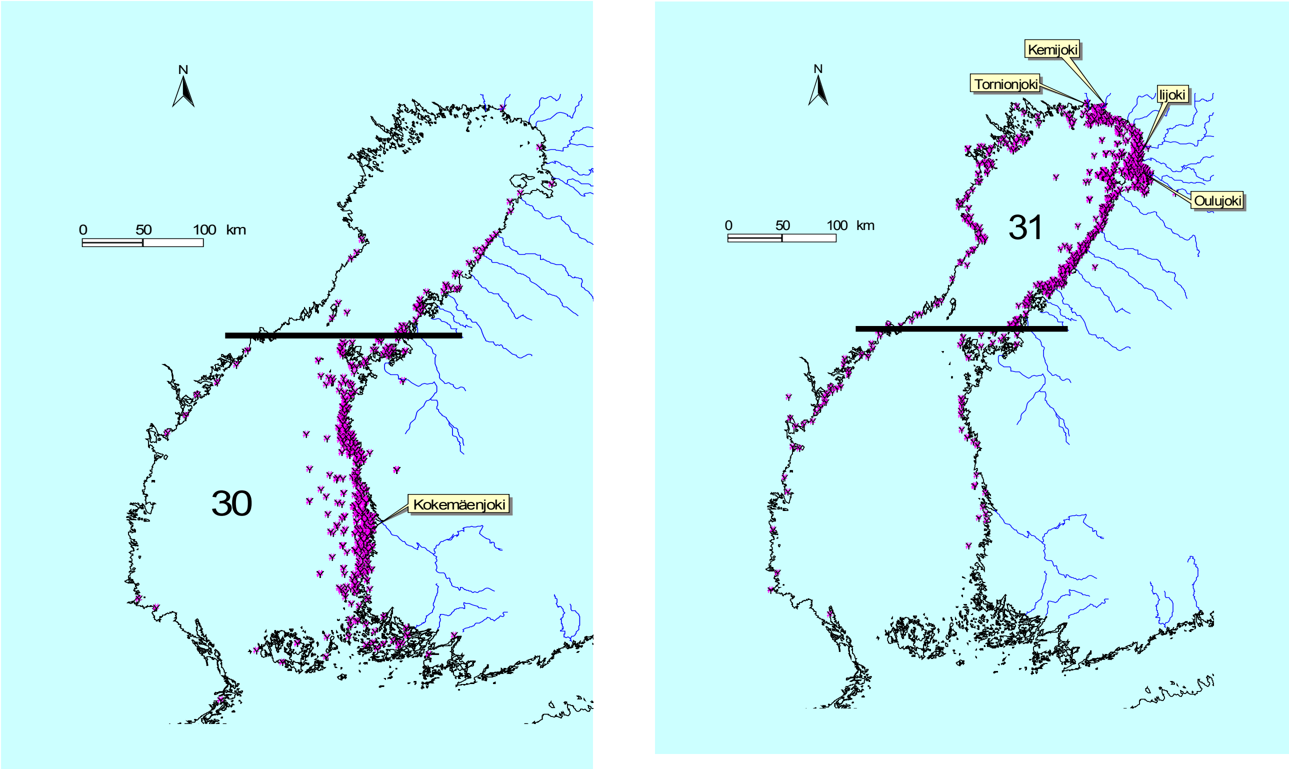


Fig.10. Distribution of recaptures of Carlin tagged sea trout smolts released in some rivers flowing into the Bothnian Bay and Bothnian Sea.

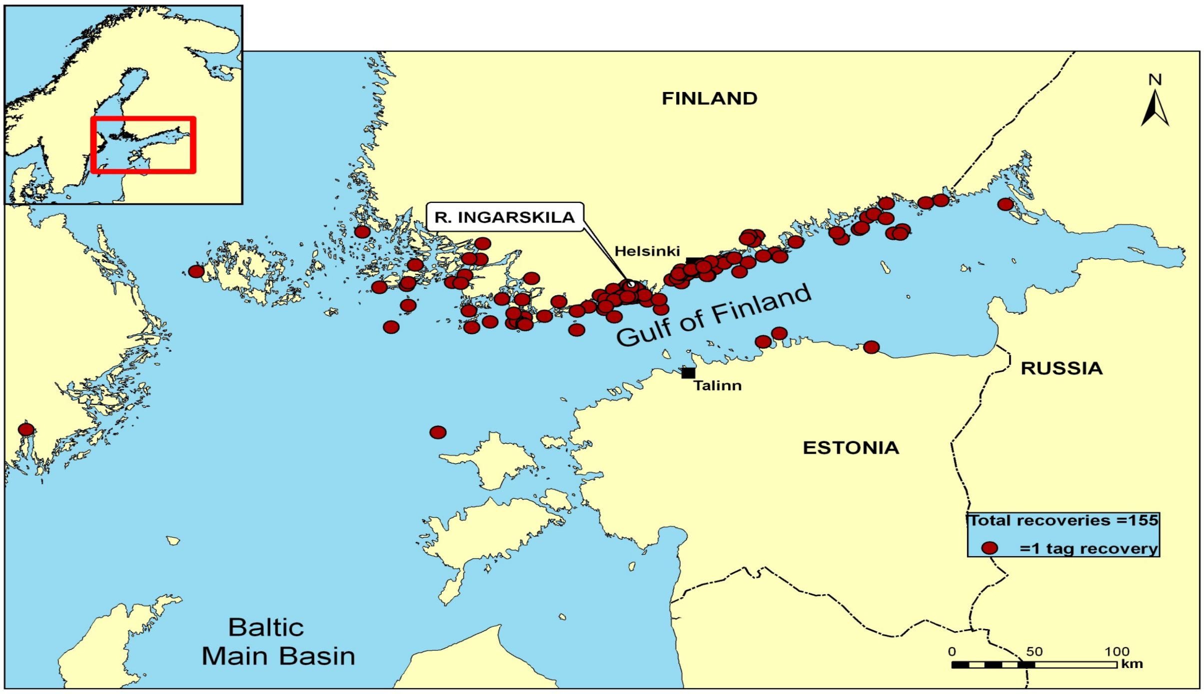


Fig. 11. Distribution of recaptures of Carlin tagged sea trout smolts released in the Ingarskila river.

Fishing effort and catch

Professional and recreational fishery

In the professional fishery, sea trout are caught as by-catch of fyke net and gill net fishery targeted at other species like whitefish and pikeperch. Thus the changes in fishing gear and fishing effort affect also the fishing pressure and catches of sea trout. The fishing effort in Finnish commercial marine fishery with fyke nets has since 2000 reduced radically, it has roughly halved within past ten years (Fig. 12). Both the fishing effort of whitefish fyke nets especially in the Gulf of Bothnia and that of salmon fyke nets in the Gulf of Finland is now less than half of their effort at the beginning of this millennium. There are many reasons for this like decreasing profitability of fishing, but particularly the rapid increase of the seal populations and damages caused by them. However, the increasing use of seal-protected push up traps has in part replaced the traditional fyke nets especially in the Gulf of Finland and in the Archipelago Sea.

A great majority of the annual sea trout catch in Finland is taken in gill net fishery in the sea. In professional gill net fishing the effort of small mesh sizes, bar length 36-45 mm, is absolutely dominating (Fig. 13). Gill nets with mesh sizes 46-50 mm are second in ranking of effort, and those with larger mesh sizes have only marginal proportion. Since year 2000 the effort of gill net fishing has not changed substantially in terms of fishing days. The increased seal populations and damages for the professional sea fishing have, however, changed fishing practices. When the seals are at place, many fishermen put the gill nets into the sea for shorter periods than earlier, e.g. for some hours instead for the whole night. This decrease of fishing time cannot be seen in the effort statistics.

In the recreational fishery in Finland gill nets are very commonly used, and the most popular mesh sizes are reciprocal to those in professional fishery. The present use of small mesh sizes in gill nets is totally inconsistent with the minimum legal landing size of sea trout in Finland (Fig. 14). Annual total catch of sea trout in recreational and commercial fishery has since year 2000 decreased from about 440 tonnes to less than 240 tonnes in 2009 (Fig. 15). The largest proportion of the catch was taken by recreational fishing. National Survey of recreational fishing takes place every second year, but it results in only rather rough and uncertain estimates on the sea trout catches. Much more precise estimates are available from the professional fishery on the basis of the log books. The annual catch of sea trout in the professional fishery has decreased from 92 tonnes in 2001 to 71 tonnes in 2009, and it reduced to 54 tonnes in 2010.

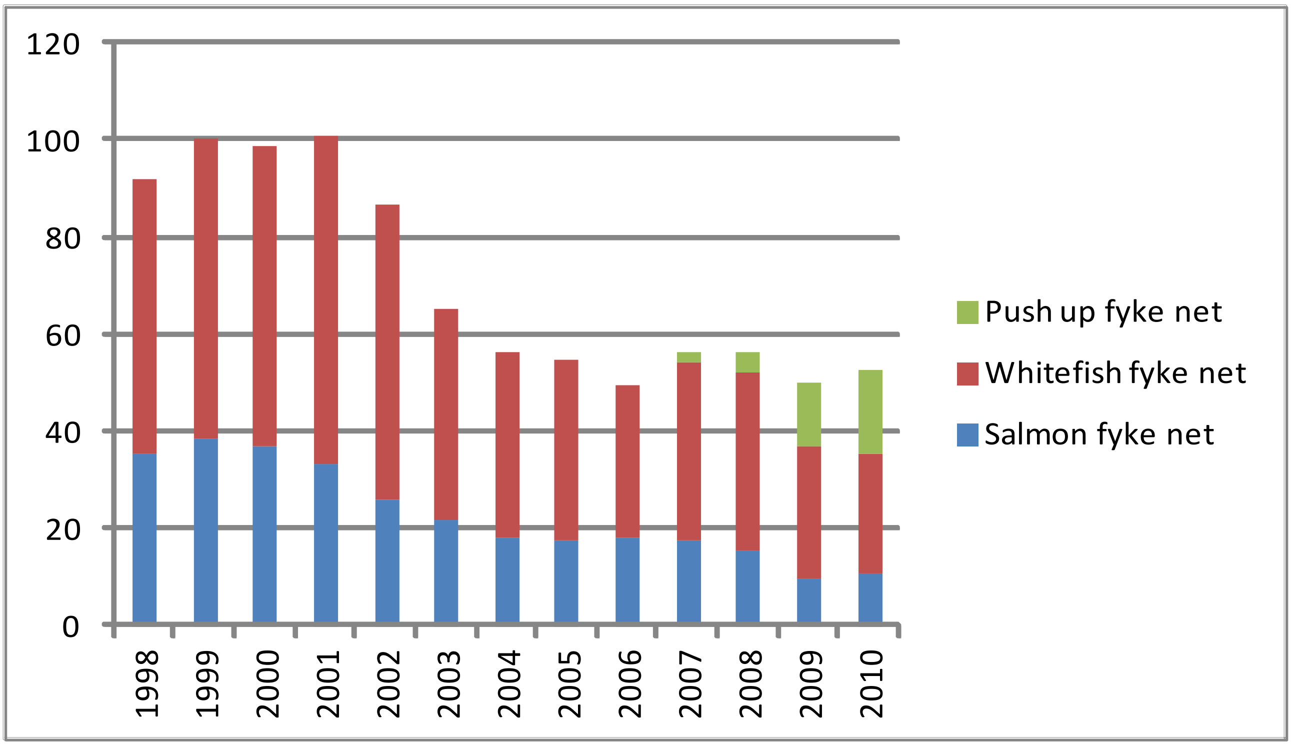


Fig. 12. Fishing effort in Finnish commercial marine fishery with fyke nets.

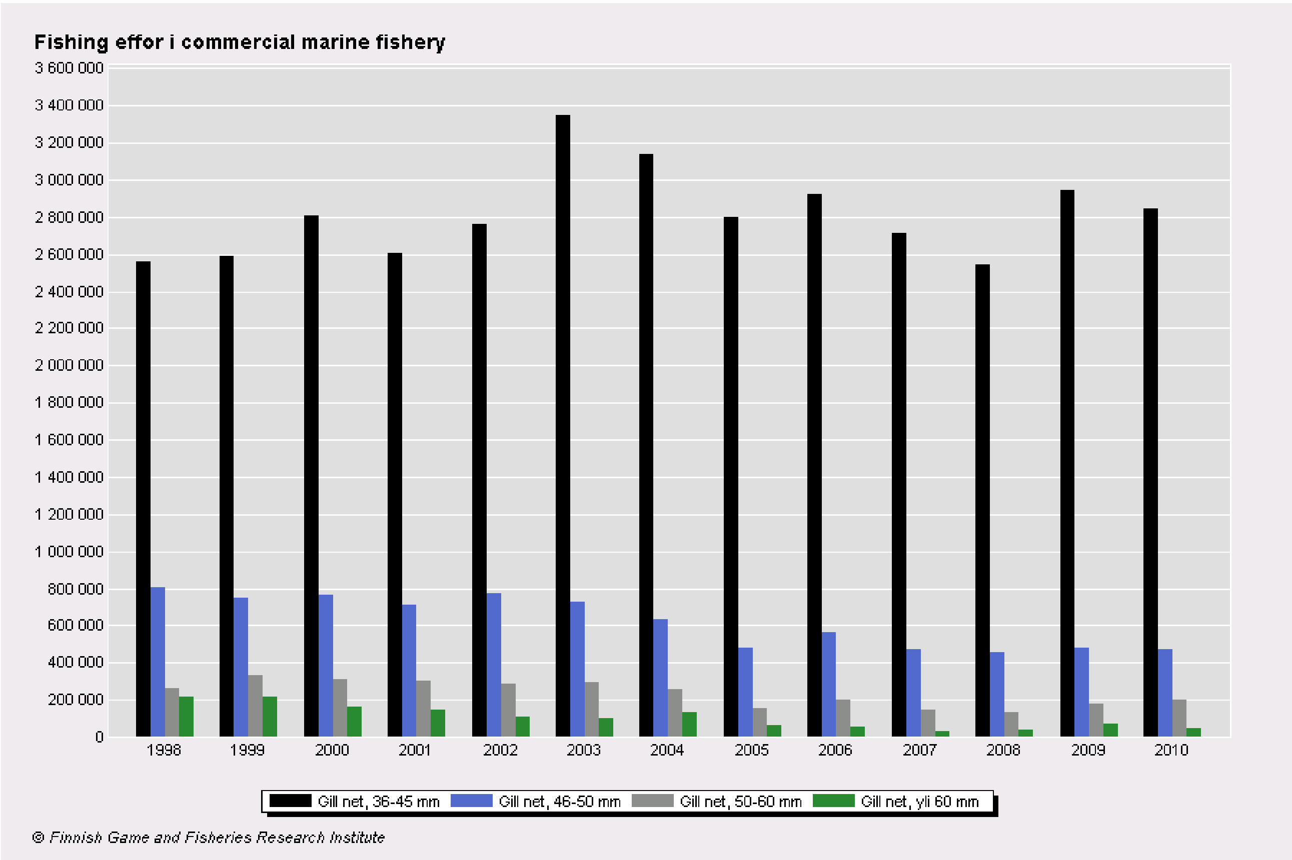


Fig. 13. Fishing effort in Finnish commercial marine fishery with gill nets

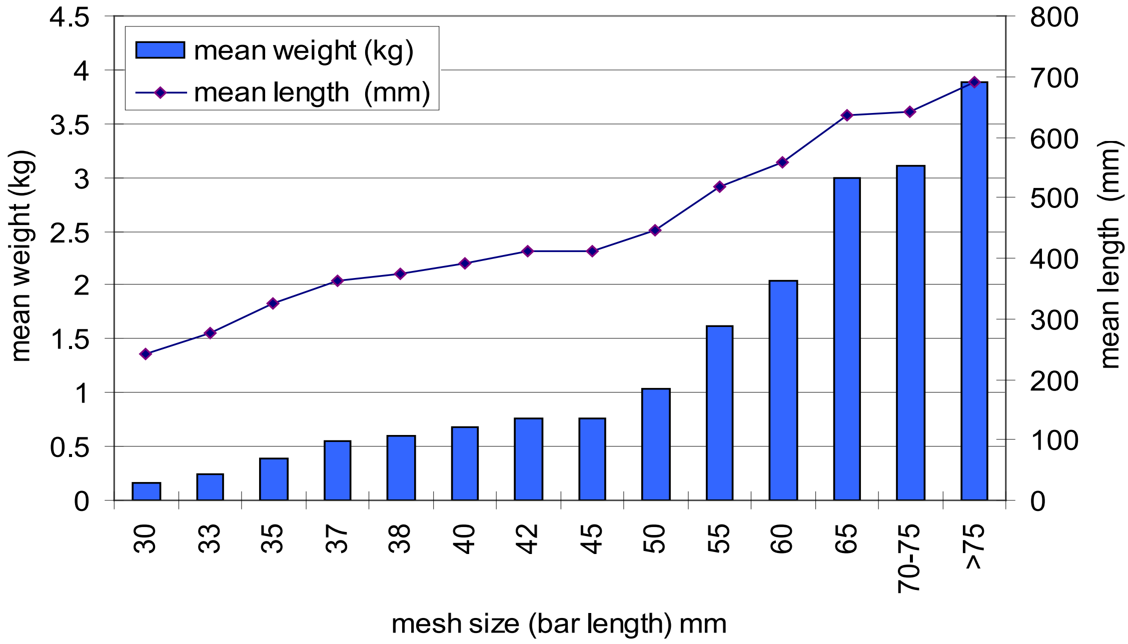


Fig. 14. Mean size of sea trout in the gill nets of different mesh sizes. The minimum landing size of 50 cm is equivalent to mesh size about 55 mm

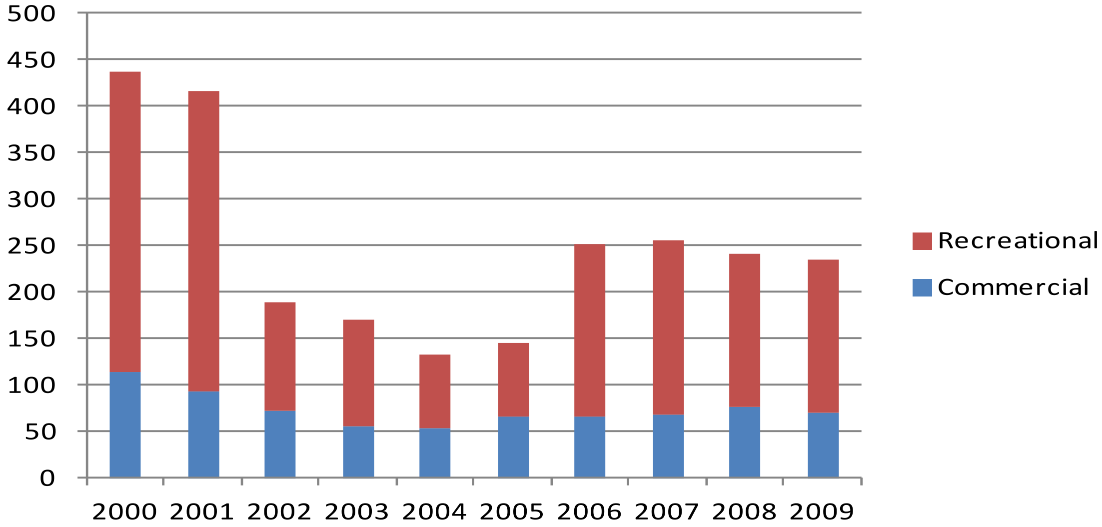


Fig. 15. Finnish total catch of sea trout in recreational and commercial fishery

Anthropogenic and other factors affecting trout populations

Migration barriers

During last century, several sea trout rivers have been closed with hydropower and mill dams. Fish ladders and natural fishways have been built during last decades especially in southern Finland, and mainly in small rivers. A national fishway strategy is now under preparation, and it may promote construction of new fishways.

Habitat quality

During the 20th century, almost all rivers and larger tributaries have been dredged for log driving. Large dredgings have been carried out in many coastal rivers also for flood prevention. Extensive drainage of forests and fields together with growing peat mining industry has increased sedimentation of sand, silt and humus components in the rapids and pools. These activities have largely destroyed or deteriorated spawning and nursery areas of migratory fish. Log driving in rivers ceased in the 1970s, and river restorations have been carried out since then especially in northern Finland. Restoration works have seldom been able to recover the habitats completely, thus additional restoration is commonly needed.

Water quality

Water quality in Finnish rivers is generally poor or satisfactory. The largest nutrient and sediment loading comes as diffuse loading from agriculture, settlements and forestry. Acid clay soils exist commonly on the coastal areas of the Gulf of Bothnia, resulting in occasionally very low pH (<5) and fish deaths in many rivers. Reduction of the nutrient and sediment loading from the fields and forests has been promoted i.a. by buffer zones and by reducing fertilization, but these measures have so far been rather ineffective. Together with other adverse conditions like inadequate fishing regulation, poor water quality impairs or restricts recovery of sea trout populations in most Finnish rivers.

Number of wild and reared sea trout smolt production

The annual production of sea trout smolts has been monitored only in the Tornionjoki river in connection with the trapping of salmon smolts. However, the smolt migration of sea trout takes place earlier in spring than by salmon and the harsh conditions during the spring flood prevent mostly the monitoring during the early season. In 2008, when the flow conditions were favourable, the natural production was estimated to about 10 000 sea trout smolt, which is about 1/10 of the estimated potential of the river system.

The Finnish releases of sea trout smolts, including the estimated smolt production from egg, alevin, fry and parr releases, has varied since year 2000 between 830 000 and 1 350 000 smolt per year (Fig. 16).

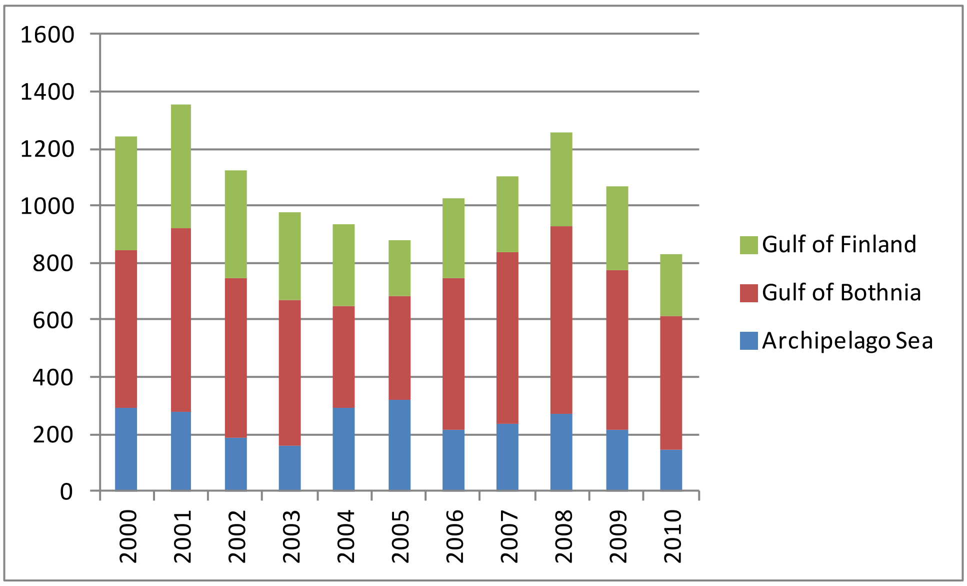


Fig. 16. Finnish releases of sea trout smolts (x1 000) to the Baltic Sea by sea areas, including smolts originating from releases of eggs, alevins, fry and parr

Fishing regulations

- Minimum landing size of sea trout is 50 cm since 2008
- **<u>Sea</u>**

  - 1/3 of the main stream must be kept open at the river mouth.
  - 80 mm minimum mesh size (bar length) in surface gill nets targeted for sea trout.
  - Off the shorenear waters in the Gulf of Finland, 65 mm minimum mesh size (bar length) in bottom gill nets targeted for sea trout.
  - Private stakeholders can voluntarily implement more restrive rules in their own water areas and at the mouth of sea trout rivers.

- **<u>Rivers</u>**

  - Angling with worm is forbidden in the rapids in salmonid rivers.
  - Gill net fishing is forbidden in most sea trout rivers.
  - 1/3 of the main stream must be kept free of fishing with fixed gear.
  - Fishing with gill nets is forbidden in the rivers 1st September-30th November, and rod fishing 10th September-30th November.
  - Complete reshaping of the fishing legislation is now in preparation, targeting also especially at the management of migratory fish.

Summary and conclusions

All wild natural sea trout stocks in Finland are critically endangered.

- The main reason is too high fishing pressure in the sea, secondarily adverse river conditions.
- Majority of sea trout are caugth premature as a by-catch by gill nets targeted at other species.
- Far too small numbers of spawners survive to rivers, which restricts the natural reproduction and hamper maintenance of the hatchery stocks.
- Efficient management measures are essential for avoiding the risk of extinction.

Fishing

- Urgent changes are necessary in fishing rules and legislation, including e.g. larger minimum mesh size, temporal and effort regulation of fishing, wider closed areas at the river mouths and larger minimum landing size.

River conditions

- Restoration works should be accelerated for improving river habitats and for removing of migration obstacles.
- Efficient measures are required for improving water quality in the rivers and for preventing risks caused by acid soils in the coastal rivers of the Gulf of Bothnia.

Finally

The critical status of wild sea trout stocks is now de jure acknowledged in Finland.
Political decisions are needed for implementation of the necessary management actions.

Russia
Status of Sea Trout populations in Russia

Sergey Titov, State Research Institute on Lake and River Fisheries, Sct. Petersburg.

Totally there are more than 50 sea trout rivers flowing to the Baltic Sea in Russia. All of the rivers are situated in two different regions: Kaliningrad Area and St. Petersburg Area.

Status of Sea Trout populations in the Kaliningrad Area

Totally 9 sea trout rivers were reported from the Kaliningrad Area and 5 of them are tributaries flowing to larger rivers. Until recently the all of these rivers have not been studied and there is no historical data concerning the abundance of the sea trout population. We have not any information concerning the current status of these sea trout populations.
By the opinion of the scientists from Kaliningrad region the total potential production capacity of the rivers of Kaliningrad Area reaches about 3500 smolts.

Status of Sea Trout populations in the St. Petersburg Area

Totally more than 40 sea trout populations were reported from the St. Petersburg Area.

Sea Trout populations in the Rivers of the North Coast of Gulf of Finland (including the Rivers of the Gulf of Vyborg)

Totally there are about 30 sea trout rivers flowing to the Gulf of Finland on its north coast and only some of them are tributaries flowing to larger rivers. The half of them is the small streams and brooks from 2 to 10 km long. And the other half is the small rivers more than 15 km long.
In the Gulf of Vyborg the all of the rivers start from Finnish territory and flow about 20 km from the Finnish-Russian boarder to the Sea.
All of the sea trout populations in the rivers of the North Coast of GF are classified as wild. No enhancement releases have been carried at all in these rivers.
The main part of the rivers is small and each of them has the reproduction area not more then 0,1-1 ha. Only in few of them reproduction area consist few hectares.
On the main part of the rapids and riffles the parr densities are not more then 5-10 individuals per 100 m^2. In our opinion, not more than some hundreds of smolts run to the sea from the each of the rivers.
In the opinion of the specialists of GosNIORKh the total number of sea trout in the rivers of North Coast of GF reaches about 6,000-8,000 smolts.

Sea Trout populations in the Rivers of the South Coast of Gulf of Finland (including the Luga River Basin)

There are not less than 15 sea trout rivers - the main rivers, their tributaries and small brooks - flowing to the GF on its south coast. The largest of them are: Sista, Voronka, Luga, Khabolovka.

The River Luga is a largest sea trout river flowing to the Gulf of Finland on the Russian territory. Its sea trout stock is classified as a complex of some local wild populations inhabiting the Luga River tributaries. Sea trout reproduces only in the tributaries of the Luga River but not along the main river. The main tributaries are the Oredezh river, Lemovzcha river and Vruda river.
Comprehensive research in the R. Luga basin was initiated at the end of 1990s. In our opinion there are not less than 8 local sea trout populations inhabiting the 1-3-order tributaries of the River Luga. There are not less than 35-40 ha of rapids and riffles in the tributaries of Luga. The main of them are located in the Vruda River and the Lemovzha River.
All but one (in the r. Vruda) sea trout population are classified as a wild populations.
There is not possibility to study the smolt run in the each of tributaries, but in the mouth of the Luga River only. At present the annual sea trout smolt run in the Luga river is about 4,000 individuals per year.
In the opinion of the specialists of GosNIORKh the number of sea trout in the other (excluding r. Luga) rivers of South Coast of GF is about 3,000-4,000 smolts.

At present not more than 13,000-16,000 smolts run to the Baltic Sea from the all of the Russian rivers. But the total potential production capacity in these rivers, in our opinion, can reach not less then 200,000-250.000 smolts.
Anyway, at present the main part of the Sea Trout populations in the Russian rivers is poor and below optimal.

Reasons for the Sea Trout populations to be below optimal

- Illegal fishing (poaching)
- The poor conditions on the spawning areas and nursery areas (rapids)
- The obstacles on the way of migrations of sea trout (dams, beaver dams etc.)
- Deforestation along the riverbanks

Suggestions for management measures to be taken to improve the situation

- Effective protection/guarding of the salmon rivers.
- Spawning areas and nursery areas restoration
- Removal of the migration obstacles
- Preventing of deforestation along the riverbanks
- Releasing of reared sea trout (parrs and smolts) to the natural nursing areas (in the same time protecting of genetic biodiversity)
- Special Attention should be paid to the Restoration of Salmonid Fish Populations in the Luga River

Estonia
The status of sea trout in Estonia 2010

Martin Kesler, Estonian Marine Institute, University of Tartu

Total sea trout catch in Estonia vary annually from 10 to 20 tonnes (Fig. 1). The main harvesting takes place on the coastal areas by commercial gear (gillnets & traps) and about 70% of the catch is taken from the Gulf of Finland area.

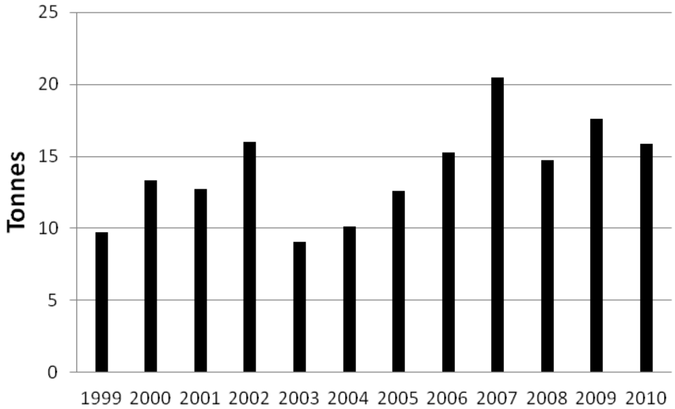


Fig. 1. Total sea trout catches in Estonia.

Fishing regulations directly related with protection of sea trout are as follows:

- In the river mouth of sea trout rivers a closed area and periods at sea: for 12 rivers and brooks 1000m (closed area extended to 1500 m for 7 rivers in 2011 from 01.09-31.10) radius all year round;
- for approximately 20 rivers and brooks 500m radius from 15 of August to 31 of December
- for approx 30 rivers and brooks 500m from 1 of September to 30 of November
- Fishery with commercial gears (except lamprey fishery) is prohibited in all rivers flowing to the sea.
- Wading is forbidden in salmonids spawning rivers in closed period.
- Total fishing ban (except lamprey and grayfish) in approximately 45 sea trout rivers all year round.
- It is prohibited to catch sea trout in freshwater from 01.09-30.11. Sea trout fishing with special license is allowed only in 7 salmon rivers at that time (except temporarily between 15.10-15.11). Bag limit in these 7 rivers (2 specimens per day).

The status of sea trout stocks are monitored annual or biannually by electro fishing. On average 80-100 sites in about 50 rivers are annually monitored.

In the **Gulf of Finland (SD 32)** area sea trout parr densities were on a low level a decade ago. The main reasons for the low abundance were high harvest rate at sea and poor hydrological conditions at that time. Extremely low level of rainfall in the autumn 2002 resulted in almost complete absence of a young-of-the- year parr in most rivers a year later. However from 2005 to 2009 steady increase in parr densities occurred (Fig. 2). Main factors affecting the overall abundance of sea trout in this region are: reduced man-made migration barriers that reduce available spawning areas, poaching in the rivers, shortage of spawners due to intensive fishery at sea and reduced habitat quality because of dredging

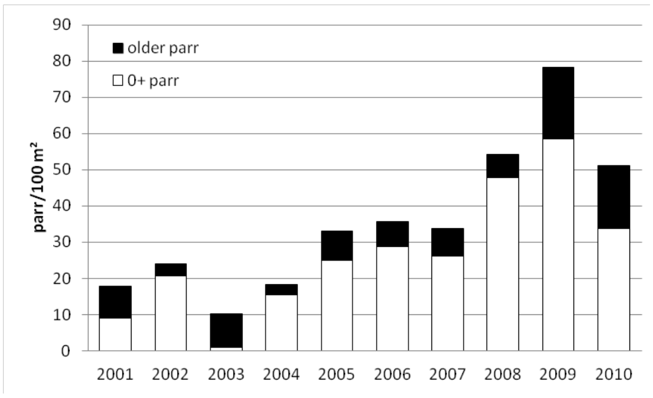


Fig. 2. Average parr density in the Gulf of Finland area at sites if they had good or very good habitat quality (N = 231).

In the **Gulf of Riga (SD 28)** area parr densities were also on extremely low level a decade ago. The regions sea trout rivers are small and the summer minimal amount of flow is very small and thus sea trout might not be able to ascend to these rivers during years of low precipitation. More favorable conditions in recent years have resulted in increased parr densities, especially in 2008 and 2009 (Fig. 3). The abundance of sea trout is strongly affected by dredging in the small coastal rivers and in the Pärnu river basin the Sindi dam prevents sea trout to reach over 90% of the historical spawning and nursery areas.

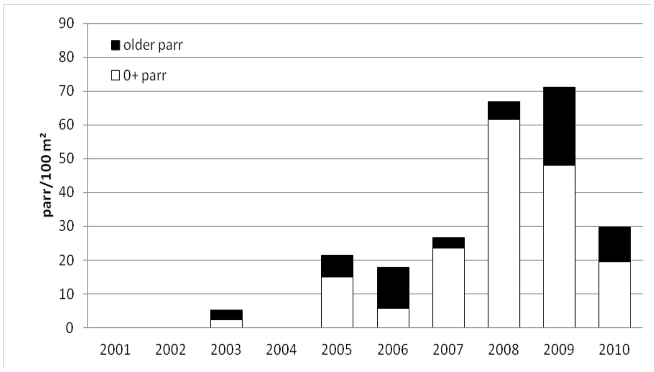


Fig. 3. Average parr density in the Gulf of Riga area at sites if they had good or very good habitat quality (N = 86).

In the **island Hiiumaa and Saaremaa** (SD 28 and 29) parr densities have only slightly increased since the year 2006. However the overall status stocks are still is a poor state. The main factors affecting sea trout abundance are dredging, poaching in rivers, intensive harvesting at the coastal areas and poor water quality in rivers.

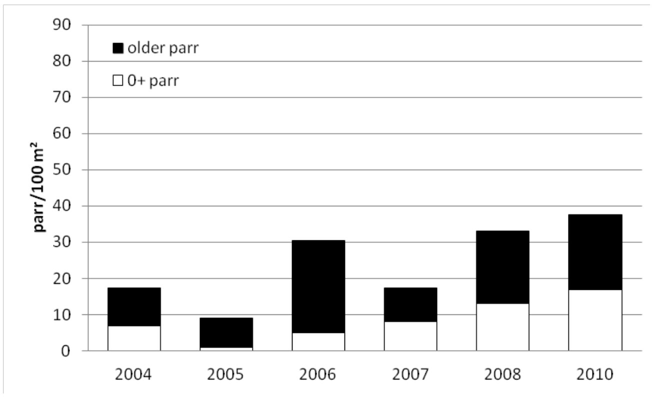


Fig. 4. Average parr density in the island Hiiumaa and Saaremaa at sites if they had good or very good habitat quality (N = 51).

Conclusions

- In the Gulf of Finland area parr densities have increased
- In the Gulf of Riga area parr densities have also increased in recent years
- On the island Saaremaa and Hiiumaa the parr densities have only slightly increased and most stocks remain in a suboptimal state

Latvia
Summary of status for sea trout in Latvian streams 2011

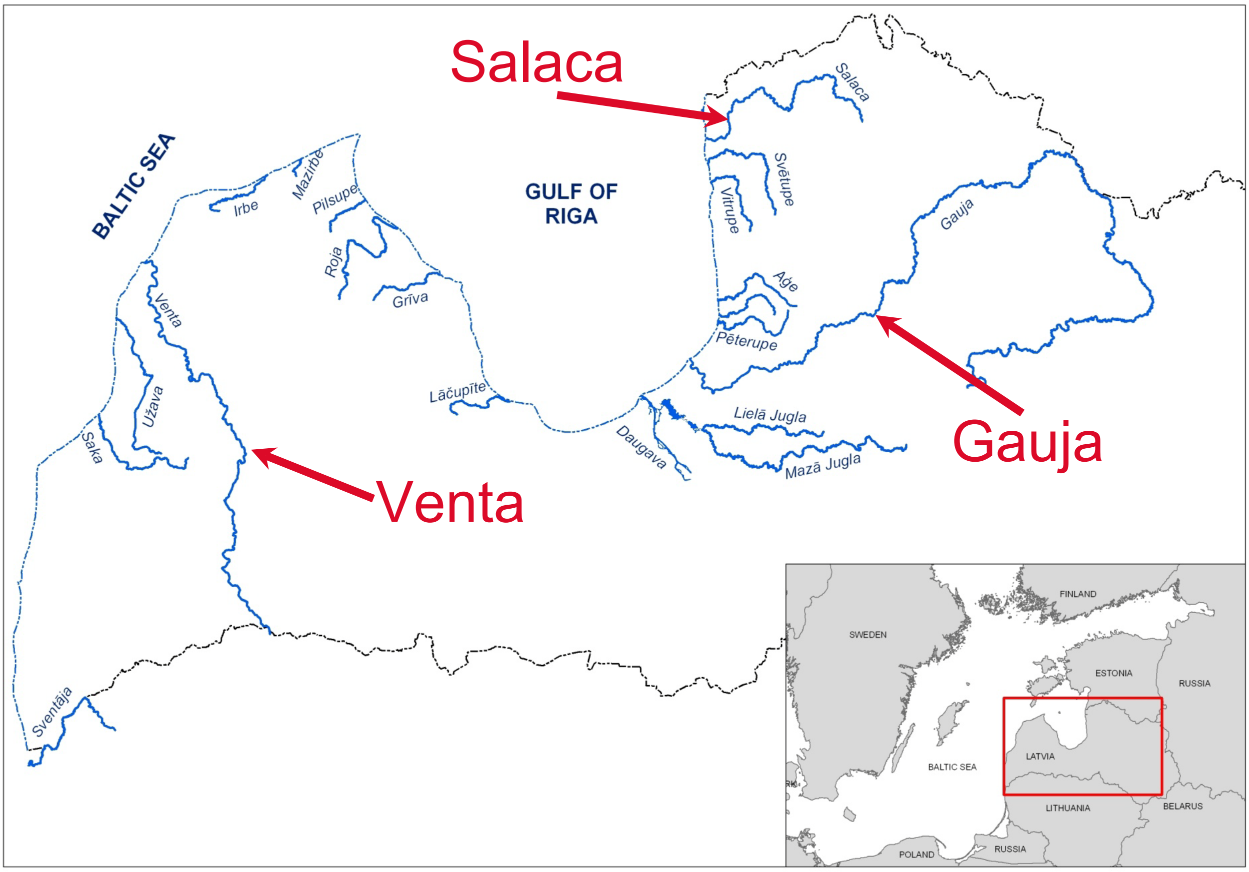
Kaspars Abersons and Jānis Birzaks, Institute of Food Safety, Animal Health and Environment „BIOR”, Fish Resources Research Department

Status for sea trout populations

Sea trout occur in 15 rivers and in almost all small rivers and brooks discharging into the Gulf of Riga and Baltic Main Basin and in majority of their tributaries. Including all small rivers and brooks, the total number of potential Sea trout streams is 50 - 100.

Large parts of most streams are inaccessible to migrating salmonids.
An estimated 60% of the country territory is inaccessible to migratory fish species due to man made barriers. However, no new barriers will be built legally in future.

The rivers Salaca, Gauja and Venta are the three most important sea trout rivers in terms of wild smolt production. In the Salaca density was on average 6.3 parr (0+ and older) pr 100 m^2, which is below average for previous years.
In Gauja the average density was in 2010 5.3 parr pr 100 m^2, which is less than average in previous years.
No data are available for the river Venta. However in the period from 2007-2009 average varied between less than one to 2.2 parr/100 m^2.



Long term analysis carried out in 1999 indicated improvement in densities in Salaca and Gauja. No recent data on status of Sea trout are available for the majority of small streams floating into the Gulf of Riga and Baltic Sea.

Sea trout populations have been supported by releases of reared fry, parr and smolt mostly into the upper sections of dammed rivers. Estimated production in all Latvian rivers was about 61,000 smolts annually in the period 2007-2009. In the river Salaca, where a smolt trap has been operated, the number of sea trout smolts has decreased during the last decade.

To conclude: sea trout seems not to be improving, but very recent data are not available, and consequently there is much uncertainty.

Fishing and fishing regulations

Approximate annual commercial catch is 10 tons. An important factor affecting the population is unreported catch of undersized fish.
A brood-stock fishery carried out in the rivers Venta and Gauja is limited by the number of gear units, and there is a daily catch limit. Fishing for special purposes is allowed with the permission of the Ministry of Agriculture and Environment.
Angling of sea trout and salmon is allowed in the rivers Salaca and Venta by a special license (fee) in springtime, i.e. catch of kelts is allowed on a limited number of licenses. In coastal waters and in the rivers Daugava and Bullupe, salmon and sea trout angling is allowed throughout the year. The

legal size which applies for all fisheries and waters is 50 cm for sea trout. All large and mid-sized rivers have closed areas at their outlets.
The bag limit for anglers is one sea trout per day. The closed season for sea trout in coastal waters of Latvia is 1 October - 15 November.

Some pouching does occur. In coastal areas this has little impact, but in smaller streams during spawning migration the impact depends on local conditions.

Water quality and habitats

Pollution now less than some decades ago, but conditions are still not perfect. While many old barriers still exist, no new barriers will be built legally. In recent years some municipalities and NGO's have removed barriers and restored spawning and nursery areas.

Most important actions to be taken to improve the status of the sea trout

- Barrier removing from migration routes and restoration of spawning and parr habitats:
- Restrictions of fishing and by-catch in fishing regulations;
- Protection of spawners by surveillance of environmental inspectors and NGO's in the spawning period.

Lithuania
Sea trout *(Salmo trutta L.)* in Lithuania
Country report

Antanas Kontautas, Vytautas Kesminas, Nature research centre institute of Ecology, Klaipėdos University

Introduction

Sea trout *(Salmo trutta L.)* is common fish species in many small and medium Nemunas first – forth level tributaries in Lithuanian territory. The species are represented by migratory (sea trout) and resident trout forms.

Fishing and catches

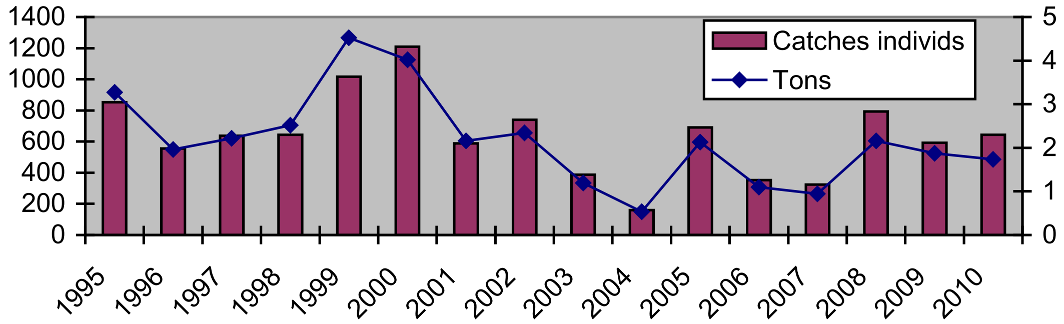


Fig. 1. Commercial catches of sea trout in the Baltic Sea and Curonian lagoon

A specialized fishery of sea trout in Lithuania is not carried out. Most often sea trout are caught in the coastal area and Curonian lagoon as a by-catch in the fishery of other species. Mean catches of Lithuanian fishermen is 644 ind. of Sea trout (which is more than the last year), with weight approx. 1,738 tones. In 2010 Lithuanian fishermen caught only 66 (0,177 t) sea trout in coastal fishery, majority of sea trout were caught together with salmon. The biggest share of sea trout was caught in Curonian lagoon - 578 (1,561) individuals. 104 ind. (0,278) were caught in the rivers for artificial rearing (Fig. 5). Angling is allowed based on licenses. Fishing terms, allowed numbers and water bodies are established.

Fishing regulations

The minimum size of sea-trout in the sea and rivers is L – 60 cm.

Regulations in the Baltic Sea and Curonian lagoon

During salmon and sea-trout migration, commercial fishery is under regulation in Klaipėda strait and Curonian lagoon. Fishery is prohibited the whole year round in the Klaipėda strait - from northern breakwater to the northern border of 15-th fishing bay. From September 1 till October 31, during salmon and sea-trout migration, fishing with nets is prohibited in the eastern stretch of Curonian lagoon between Klaipeda and Skirvyte, in 2 km distance from eastern shore. From September 15 till October 31 commercial fishery is prohibited in 1 km radius from Šventoji and Rėkstyne river mouths and from southern and northern breakwaters of Klaipėda strait.

Regulations in the rivers

Sea trout angling in the rivers permitted with valid licenses only. License amateur fishing of Sea trout permitted in 9 Lithuanian rivers in specially designated stretches. Annual quota for sea trout licenses - 750 specimens. Sea trout fishing is legal from 15 of September till 15 of October and 1st of January till 1st of May.

Sea trout stocks

Salmonids inhabit more than 180 rivers in Lithuania (Kesminas, Virbickas, 2001). River trout inhabits 76 rivers, Baltic salmon spawned in 14-16 Lithuanian rivers (Baltic Salmon Rivers, 1999; Baltijos lašiša Lietuvoje. 2000). .

According to expert evaluation in 1999 potential sea trout smolt production there is 323 800 specimens. By the smolt trapping data the estimated total number of smolts in recent years was 34000 - 46000 totally.
The estimated number of spawners migrating to the Nemunas catchment area varies between 11 500 individuals (1992) and 1 800 in 2003, but in average it is around 4 000 individuals each year (Fig. 2).

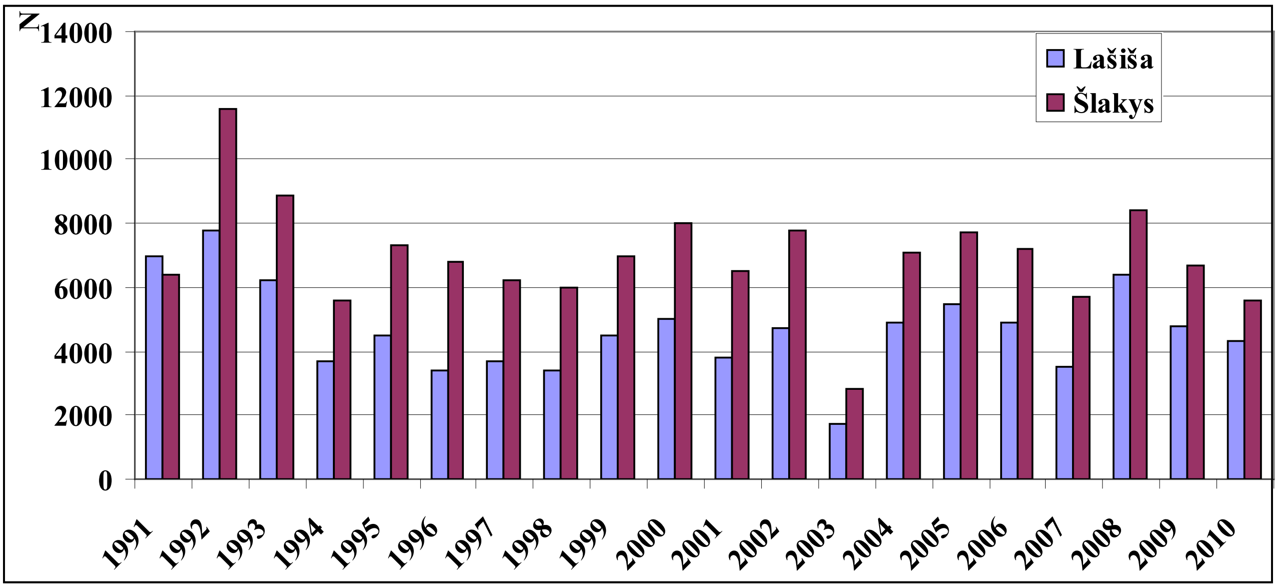


Fig. 2. Abundance of salmon (Lasisa) and sea-trout (Slakys) (N - individuals) migrating to the Nemunas basin, 1991-2010 (Repečka, 2010)

Table 1. Sea trout stocks and their status in Lithuania

River basin	**Number and status of sea trout stocks**		**Potential smolt production**	**Notes**
	Original/ probably original	Stocked/Mixed		
Neris basin	1 poor	1 good 3 satisfactory 3 poor, 1 critical	50 000	Supportive stocking in 12 rivers
Žeimenos basin	3 poor, 2 critical	1 poor	50 000	Supportive stocking in 1 river
Šventosios basin		1 good 2 satisfactory 3 poor	25 000	Supportive stocking in 7 rivers
Minijos basin	4 good, 6 satisfactory		93 700	
Jūros basin		2 satisfactory 6 poor	51 100	Supportive stocking in 6 rivers
Dubysos basin		3 good 1 poor	30 500	Supportive stocking in 4 rivers
Bartuvos basin	1 satisfactory 1 poor 1 critical		10 000	
Akmenos - Danės basin	1 satisfactory		5 000	
Šyšos basin	1 good 1 poor		2000	
Baltijos - Šventoji basin		2 satisfactory 2 poor	5 900	Supportive stocking in 4 rivers

Status of sea trout populations

Population of sea-trout in Lithuania is larger than that of salmon. Wild sea-trout populations are known in 10 rivers basins. Abundance of sea trout were larger in small tributaries. The average density of juveniles (0+ - 2+) in rivers are fluctuating, in last years – from very high number tol very low. Survey were done in 75 sites, average mean density in the rivers of juveniles varied from 2,9 to 28,2 (mean – 12 ind./100 m^2). Average Sea-trout smolt production in this time was 24 513 individuals. Unfortunately salmonids monitoring were not performed in many smaller rivers, therefore productivity was assessed using data of previous years. Sea-trout population is particularly numerous in the Western Lithuania – Minija River catchment. Average density of sea-trout parr in Minija catchment was 13,1 ind/100m^2, smolt production – 8 033 individuals (Table 1). Smolt production was significantly lower in the other river catchments.

Table 2. Electrofishing survey of average wild sea trout parr in investigation Lithuanian river basins 2005- 2010 (Kesminas & Kontautas, 2010)

River	**No. sites sampled**	**Parr No of 0+ and >0+// 100 m^2**	Range	**Smolt production**	Range
Neris basin	15	2,9	1,6-4,4	5867	3700-12200
Žeimenos basin	10	2,7	0-4,7	2200	0-4300
Šventosios basin	8	4,2	0,4-11,2	4033	2500-5100
Minijos basin	15	13,1	7,1-31,5	8033	5200-12500
Jūros basin	10	7,5	1,5-23,3	1050	800-1900
Dubysos basin	6	16,9	4,4-35,8	1683	400-4600
Bartuvos basin	3	13,1	2,7-33,2	218	100-500
Akmenos - Danės basin	2	28,2	10,4-57,9	587	220-800
Šyšos basin	2	21,4	1,6-58,3	533	300-1000
Baltijos - Šventoji basin	4	9,7	5-18,4	310	100-600
Total	**75**	12		24513	

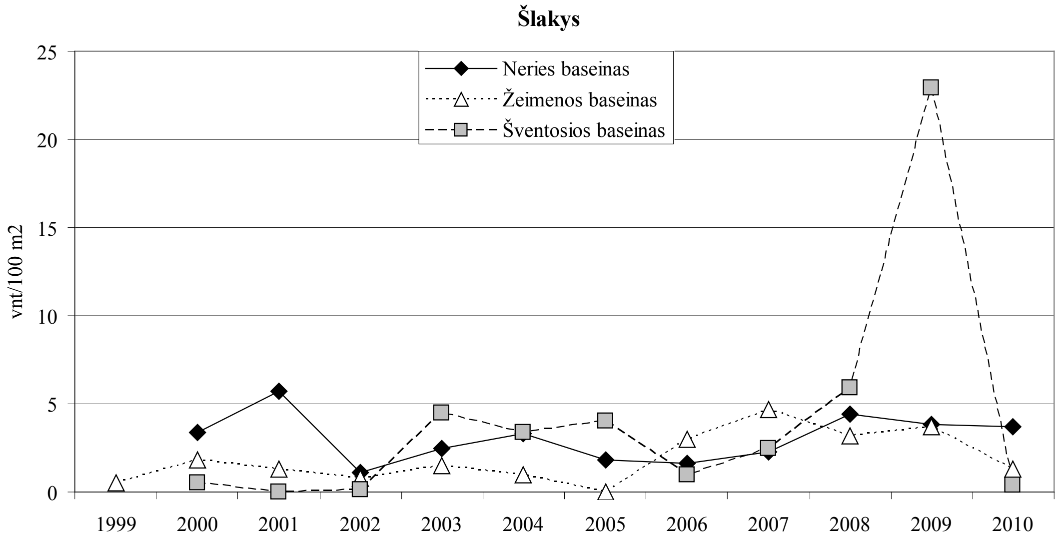


Fig. 3. The number of sea trout juveniles (ind. /100 m²) in Neris, Žeimena and Šventoji river catchment

Sea-trout smolts populations structure in rivers

Fig. 4. Sea-trout smolts migration investigation performed in the Mera river (Žeimenos basin) and Siesartis river (Šventosios basin)

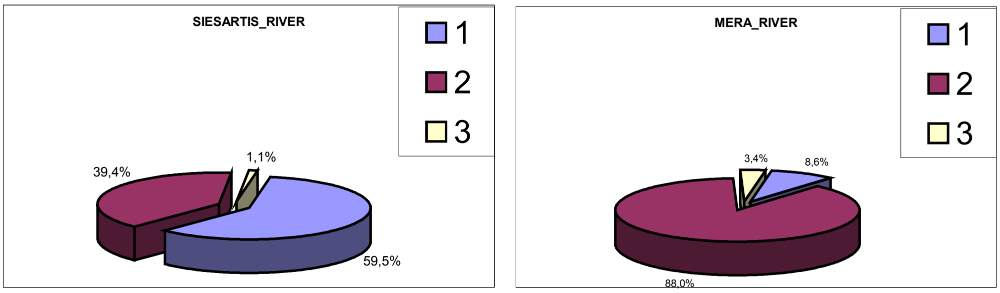


Fig. 5. Sea-trout smolts age structure in the Mera and Siesartis rivers

The age of sea trout smolts migrating to the sea is different in some rivers. Usually they are migrating as 2 yers old, but, for example, in Siesartis river the larger part of smolts is 1 year old (60%).

Releases and reared population

Artificial rearing of sea trout in Lithuania started in 1999 with construction of the first hatchery. In Lithuania the majority of sea trout are released as fry, other part of released sea trout there are parr. Egg production is solely based on captured wild sea trout in some rivers. There are no special criteria for sea trout stocking. Minimal size of fry released in rivers is 0,8-1,2 g. Parr mainly released with weights of 11-18 g. Stocking efficiency is monitored every autumn in indicator rivers. Smolt stocking is low compared to younger specimens.
In 2010 75 thousand individuals of sea-trout fry, 20 thousand of one-summer old parr and 45 thousand of 1 year old smolts were released. Sea trout fry were released into 21 rivers, mainly in small salmon-type rivers. One summer old parr and smolts were released into the largest rivers: Neris, Šventoji, Minija, Dubysa and Jūra.

Tagging

Limited numbers of sea trout and salmon were also tagged with PIT tags and radio tags. No fin clipping was made in Lithuania.

Research and monitoring

The monitoring program is carried out since 1998 and consists of electrofishing surveys in sea trout rivers, smolt trapping, mapping of reproduction habitats, monitoring of reds and statistics of commercial catch data. The main research activities are in investigation of upstream migrations, radio tagging and population genetics.
In recent years monitoring and restoration works of salmon and sea-trout have been carried out in accordance with Lithuanian Salmon Action Plan, 1997 – 2010.

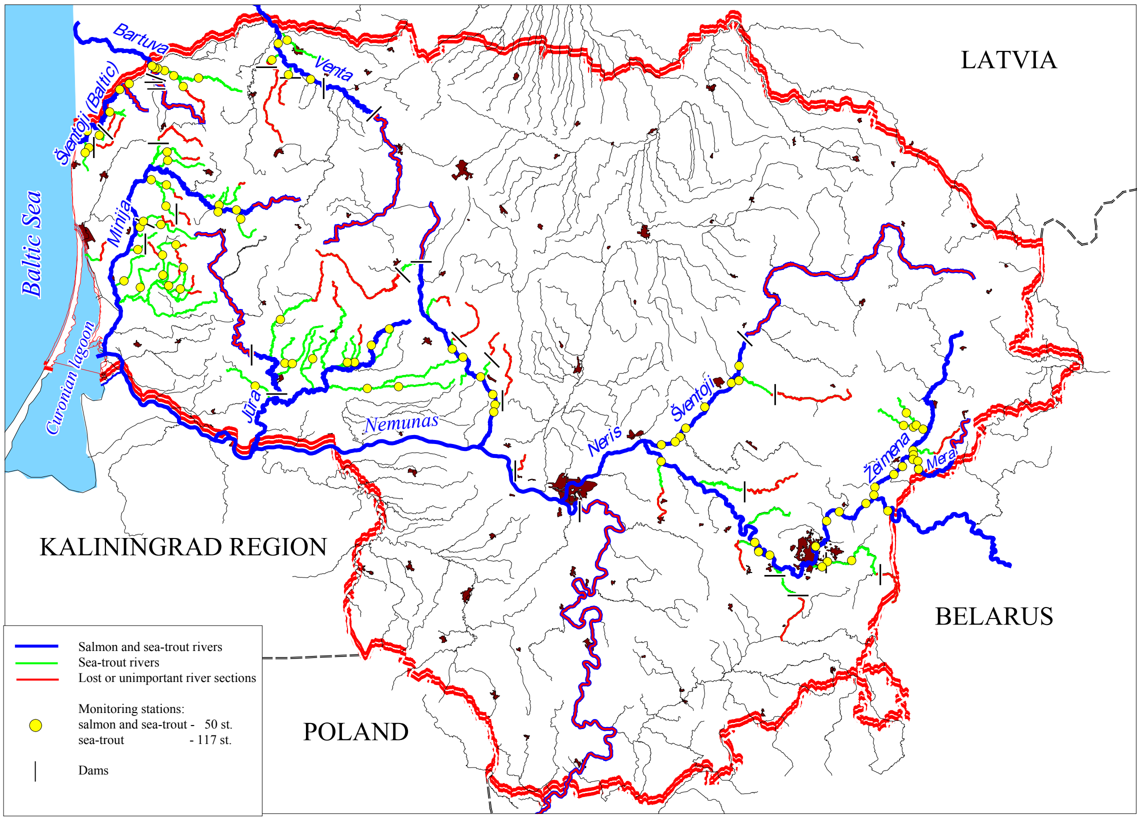


Fig.6. Salmonid rivers and monitoring stations

Improvement measures in sea trout rivers

Table 3. Improvement measures in sea trout rivers

River basin	Fish ways and measures to improve migration	Restoration	Restocking
Neris basin	**2 fish ways operating/ 4 needed**, measures to improve migration in some places	partial in some rivers	needed
Žeimenos basin	measures to improve migration in some places	no	no
Šventosios basin	**3 fish ways operating/ 3 needed**, measures to improve migration in some places	partial in some rivers	needed
Minijos basin	**2 fish ways operating/1 is needed,** measures to improve migration in some places	no	no
Jūros basin	**1 fish way operating/ 2 needed,,** measures to improve migration in some places	partial in some rivers	needed
Dubysos basin	**1 fish way needed,** measures to improve migration in some places	partial in some rivers	needed
Bartuvos basin	measures to improve migration in some places	no	no
Akmenos - Danės basin	measures to improve migration in some places	no	no
Šyšos basin	measures to improve migration in some places	no	no
Baltijos - Šventoji basin	**1 fish way needed/** measures to improve migration in some places	partial in some rivers	needed

Potential rivers

Table 4. Potential rivers

River basin	**Estimated number**	**Potential smolt production**
Venta basin	3	15 000
Merkys basin	7	50 000
River stretches upstream of dams	6-10 (?)	**?**

Needs of national conservation and management measures

Main measures to improve status of sea trout populations in Lithuania should be:

- To increase minimum mesh size for gill nets in the coastal fishery.
- To reduce illegal fishing impact in the sea, migratory rivers and reproduction areas.
- The preparation and implementation of Management plans for sea trout rivers.
- The construction of fish ways where this is needed.
- The recovery plans for potential sea trout rivers
- The improvement of river water quality in salmon rivers

Concluding remarks

Almost all sea trout stocks in Lithuania are in a poor state. Only few river stocks are satisfactory. The main reason for the present decline is too high fishing pressure in the sea and coastal fishery and illegal fishing in rivers during spawning migration and spawning period. Majority of sea trout are caught in coastal areas as a by-catch by gillnets for other species. Low numbers of spawners result in risks for natural reproduction. Restocking was effective in some rivers, but improving of the spawning and rearing habitats is needed. Restocking plans for potential sea trout rivers should be continued. Promotion of international communication in research and management is needed. As critical status of many wild sea trout stocks has been clearly acknowledged by the experts, political decisions are needed for improving management actions.

Poland
Polish national report

Piotr Dębowski, Inland Fisheries Institute, Department of Migratory Fishes, pdebow@infish.com.pl

Rivers

Salmonid fishes inhabit two large regions in Poland: one mountainous upland region in southern Poland (in the upper sections of the river systems of Vistula and Odra), and another in the moraine hills in northern Poland that are drained by tributaries of the lower Vistula and Odra and by rivers flowing directly into the sea.

The rivers in the southern region are affected by many barriers. In the Odra system, they are mainly located in the tributaries of the upper part cutting off all of them. Some of the barriers are more than one hundred years old.

In the Vistula there are also some dams in the upper tributaries often in historical spawning places. The main hindrance is, however, the hydropower station and dam of Włocławek that was built in 1969 in the middle section of the river. Almost none of these barriers are equipped with effective fishways.

All the rivers in the northern region have hydropower stations that were generally built in the beginning of the 20th century, often to replace older structures. Most of them are located in places of transition from hills to plains cutting off historical spawning places in upper parts of their drainage areas. Some of them have fishways, but only a few are effective.

Many rivers, especially the smaller rivers in the southern region, are regulated or channelized and have an altered substratum. The river bed has been destroyed by removal of gravel in mountain areas, and the dynamics of the river flow is changed by impoundments disrupting natural processes in a river bed.

The quality of water used to be very poor in the past, especially in the bigger rivers and in southern Poland, but it has very much improved in recent years.

Populations

If we consider a sea trout river as a river where spawning of sea trout occurs or/and it is regularly stocked with hatchery fish, a number of sea trout rivers in Poland is around 25 (Fig.1).

Two rivers flow into the Vistula Lagoon, six (including the main river) are in lower part of the Vistula drainage basin, two flows into Gulf of Gdańsk, nine – directly into the sea, two – into the Szczecin Lagoon, and four (also including the main river) are in lower part of the Odra drainage basin.

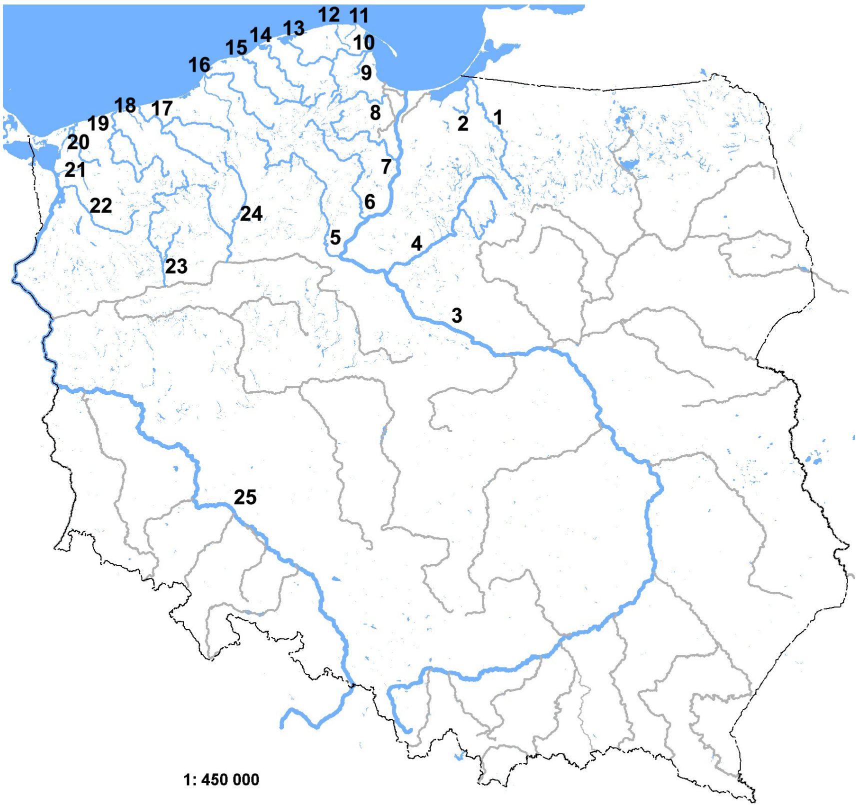


Fig.1. Sea trout rivers (see table 1 for details).

Table 1. Sea trout rivers in Poland

Nr	SD	River	Name rivers all the way to sea	Catchment area (km2)	Length (km)	CATEGORY (1-8)	River length accessible (km)	Reproduction area (spawning/nursery) (ha)
1	26	Bauda		342	58	5	100	
2	26	Pasłęka		2321	187	7	45	0/1
3	26	Vistula		199813	1020	7	675	
4	26	Drwęca	Vistula	5697	231	5	287	
5	26	Brda	Vistula	4665	245	7	3	0/0
6	26	Wda	Vistula	2324	198	7	11	0/0
7	26	Wierzyca	Vistula	1607	170	7	2	0.1/0.5
8	26	Radunia	Motława, Vistula	822	93	5	13	
9	26	Zagórska Struga		149	29	1	10	0.3/0.5
10	26	Reda		485	50	5	25	1/15
11	26	Czarna Woda		88	20	4	17	0.1/1
12	26	Piaśnica		319	30	4	14	0.5/2
13	25	Łeba		1768	127	5	75	1.5/9
14	25	Łupawa		924	111	7	13	0/2
15	25	Słupia		1621	152	4	78	1.7/15
16	25	Wieprza		2213	133	5	120	1.5/20
17	25	Parsęta		3084	143	4	123	3.5/33
18	25	Błotnica		319	28	5	19	
19	25	Rega		2767	188	5	68	
20	24	Wołczenica		462	52	6	66	
21	24	Gowienica		368	51	4	27	
22	24	Ina	Odra	2151	125	5	65	
23	24	Drawa	Noteć, Warta, Odra	3291	192	4	65	4/30
24	24	Gwda	Noteć, Warta, Odra	4947	140	7	0	
25	24	Odra		119074	840	7	571	

Only one small stream has a wild population, 16 are mixed, and 8 – reared, what means that no (or very small) natural reproduction occurs and their stocks are kept by stocking (Tab.1).

Reproduction

Adult sea trout enter Pomeranian rivers mainly in October-November with smaller run in the beginning of July depending of water discharge (Fig.2). Spawning usually begins in last week of October and ends in the first week of December. Majority of spawners are after one winter in the sea and are in average around 50 cm long (Fig.3).

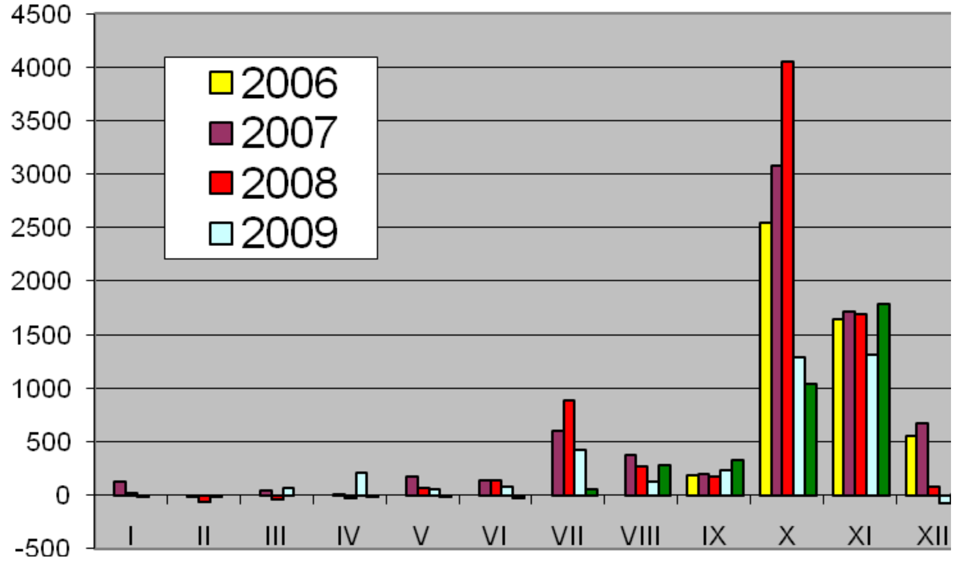


Fig.2. Number of spawners in months recorded by a fish counter in Slupia River

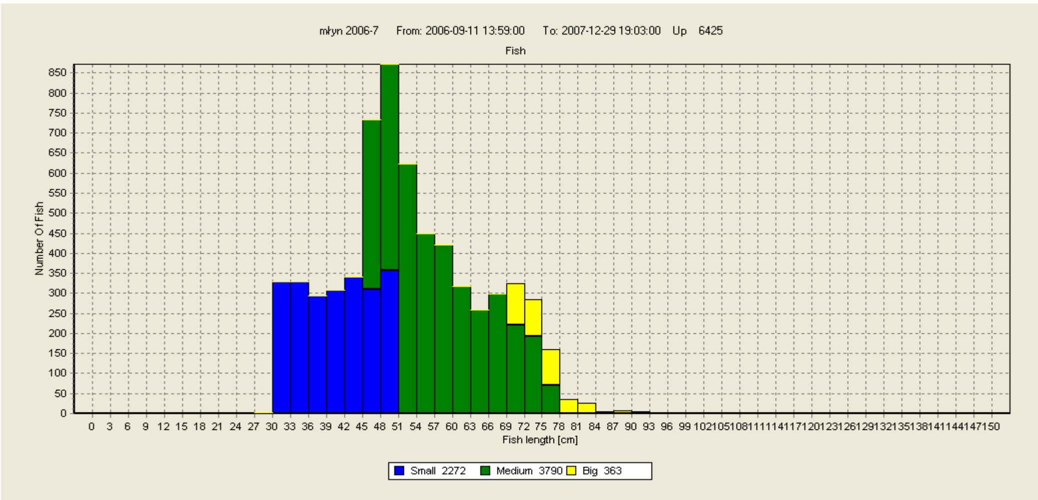


Fig.3. Histogram of length of spawners recorded by a fish counter in Slupia River

For a few years spawners in some Pomeranian rivers have suffered chronic dermatological disease - ulcerative dermal necrosis (UDN). Its intensity was very high in 2007-08 and lately seemed to decrease.

Because of inaccessibility of majority of historical/potential spawning places, spawning take place usually in small tributaries or in small spots in main rivers. So, total area of suitable spawning places in many rivers systems is very small. Average density of 0+ parr on monitored spawning grounds usually is around 50, but on some sites can exceed 150 inds/100m^2 (Fig.4).

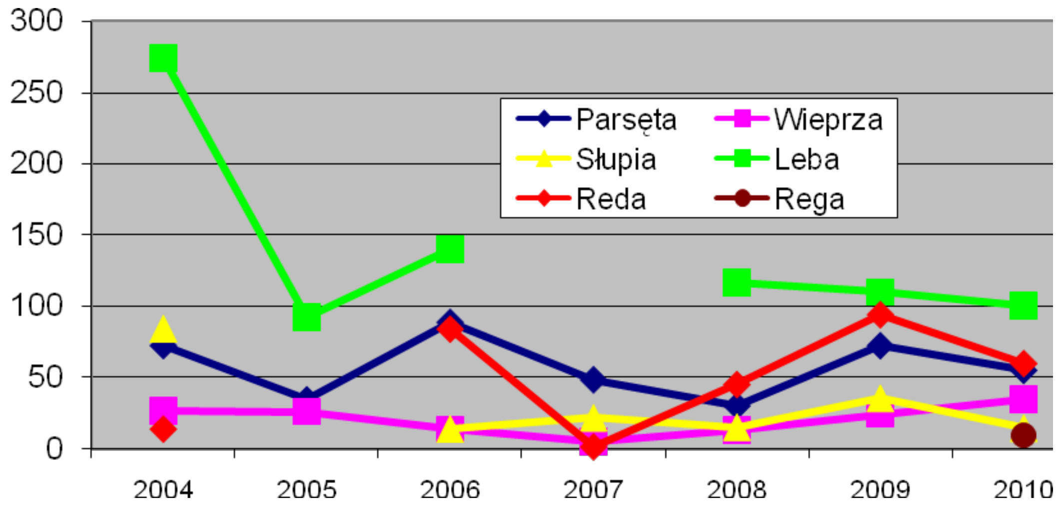


Fig.4. Mean densities of 0+ parr (inds/100m^2).

Stocking

Almost all Polish sea trout rivers are stocked with hatchery fish. Since 70-ties with fish originated from local stock or, in cases of smaller rivers, from neighbouring river. Around 1.4 mln smolts are released annually lately, more than 60% - to Vistula R., and 6-7 mln of alevins and fry, mainly into Pomeranian rivers (Fig.5).

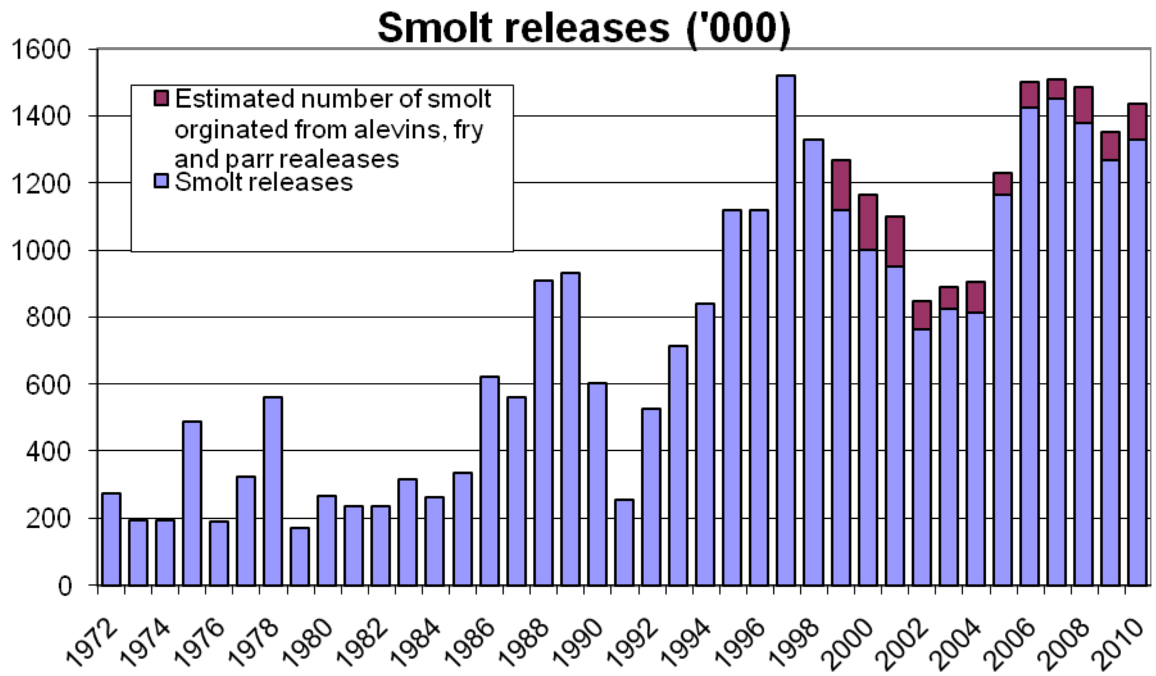


Fig.5. Smolt releases.

Catches

River catches during last few years vary around 30 tons (Fig.6). It is mainly commercial fishery in lower Vistula and catching spawners for breeding purposes. There is quite intensive angling in many rivers, especially in Pomerania, focused mainly on kelts. The number of caught fish can be very roughly estimated at 2-3000 totally. It's believed that poaching exceeded this figure a lot.

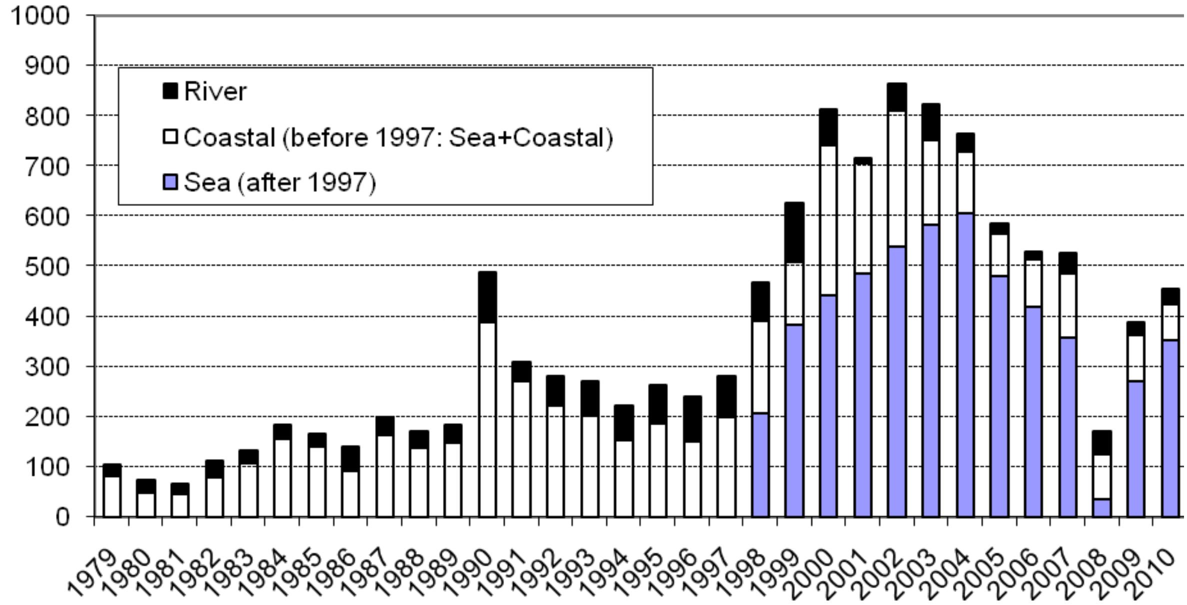


Fig.6. Polish commercial catches.

Sea trout in Polish coastal waters are caught mainly by anchored gill nets. It was less than 20 % of total catch of sea trout lately. Almost 80% of fish is caught by offshore fishery. They are fished using the same method, in the same places, and together with salmon. There is increasing interest in coastal angling for sea trout; so far a catch doesn't exceed a few hundreds fish, probably.

Polish commercial catches of sea trout constituted almost 70% of total catch in Main Basin in 2010. They were the highest in 2002-2003 (above 800 tons), than rapidly decreased in 2008 to 172 tons, and again increased to 454 tons in 2010 (Fig.6). The regress was a result of ban on driftnets. The actual sea catch of Polish sea trout is overestimated because due to TAC restrictions salmon is likely reported as sea trout. According to WGBAST the misreporting in 2010 could be around 70000 fish less than reported and a total weight of 190 t.

Regulations

The regulatory measures for sea trout in off-shore fishery (outside 4 miles) are common for all EU MS in Baltic Sea.

The regulations in coastal fishery are:

- minimum landing size 50 cm;
  minimum mesh bar 80 mm;
  1 mile closed zone off the mouth of Vistula R.;
  500 or 250 m closed zone off mouths of other rivers;
  closed season 15 th September – 15 th November, except Gulf of Gdansk and Vistula Lagoon.

And in freshwaters:

- minimum fish length 35 cm;
  closed season:
    - 1 st October - 31 st December and 1 st December – 29 th February in different parts of Vistula with some additional restrictions;
    - 1 st October - 31 st December in other rivers;
- in majority of rivers managed by anglers associations only rod fishing with artificial lure is allowed;
- in rivers managed by anglers associations catch of maximum 2 fish per day is allowed.

Main obstructions

- The main problem is very restricted spawning area in the majority of rivers. It is partly a consequence of character of, especially Pomeranian, rivers but also because many historical/potential spawning grounds are cut off by barrages and destroyed by impoundments, unnatural discharge regimes, and, in highland areas, gravel extracting.

- Access to spawning rivers is hindered by coastal fishery, especially in areas excluded from closed season regulations (Gulf of Gdańsk).

- Adult fish concentrated on spawning grounds are target of intensive poaching.

- Outbreaks of diseases triggered most probably, among other things, by poor sanitary conditions in lower parts of rivers.

- Poor quantitative knowledge about status of sea trout populations: size of spawning populations, smolt production, effectiveness of stocking etc., makes difficult efficient protection, improvement and management.

- Coastal herring fishery at smolt migration.

Trends

- There are a several new fishpasses under construction and a few tens planned, also on sea trout rivers, founded by EU. One of them is a fishpass at Włocławek dam, key barrage in Vistula river system. It should open big new reproduction area to sea trout.

- Monitoring systems of the fishpasses will provide new data about populations and their migrations together with increasing effort into monitoring of natural reproduction.

- The most important spawning grounds are permanently protected during spawning by volunteers from angling clubs, and this activity spreads on more rivers.

- There are no increasing trends observed in the development of populations, so far.

Germany
Sea trout in Germany

Harry Hantke, Fisch und Umwelt, Rostock, Germany.

Report of investigations for sea trout in Germany

This report contains only data from Mecklenburg Western Pommerania because data from Schleswig Holstein are not available in official agencies. That is the result of political structure in Schleswig Holstein, that means the streams are principally in private hands and there no official programs for investigations.

Mecklenburg Western Pommerania

Beginning in the 90ties of the last millennium first investigations on biomass and stocking of sea trout have been carried out. The main goal was the stabilization of the different sea trout stocks in rivers of Mecklenburg-Western Pomerania. The stocking material originated from rivers in Schleswig Holstein and from a remaining wild stock from the river Beke a tributary to the river Warnow.

Beginning in 2000 investigations on sea trout rivers were extended to the entire state. The aim was to identify appropriate rivers for sea trout stocking. In the period 2000 - 2010 altogether 6,500,000 parrs were stocked into 33 rivers of Mecklenburg-Western Pomerania.
Presently 9 rivers contain a self- recruiting wild sea trout stock, e.g. the rivers Beke, Hellbach, Kösterbeck, Peezer Bach and Tarnewitzer Bach. In the rivers Köppernitz, Damshäger Bach, Ziese, and Hanshagener Bach, we find natural reproduction mixed with stocking material.

Assessment of recruitment is based on electrical fishing only. No other methods have been used so far.

The monitoring is a part of the stocking programme. After stocking in spring, monitoring in autum is directed to the development of the stocked parr and smolts. Furthermore investigations on spawning sites and habitats, and anadromous spawners have been carried out. After evaluating these parameters possible continuation of stocking will be decided upon.

The main goal is collecting data about stock and recruitment development of sea trout in Mecklenburg-Western Pomerania waters and the determination of the carrying capacity of these waters.

On the map in Fig. 1, is shown the position of streams with natural reproduction without stocking in recent years. In Peezer Bach, Tarnewitzer Bach and Hellbach we established the pilot projects with videocounting and RFID.

On the following pages are presented data from parr densities in streams with wild stocks and stocked streams. These are data from the official stocking program in Mecklenburg Western Pommerania.

Fig. 1. Position of streams with natural reproduction (no stocking)

Table 1. Sea trout parr density per 100 m stream lenght in streams with natural reproduction.

	2001	2002	2003	2005	2006	2007	2008	2009	2010	2011
Peezer Bach						156	30	151	71	161
Damshäger Bach							14	60	64	96
Tarnewitzer Bach								30		55
Hellbach				110	110					
Beke	83	33	29							

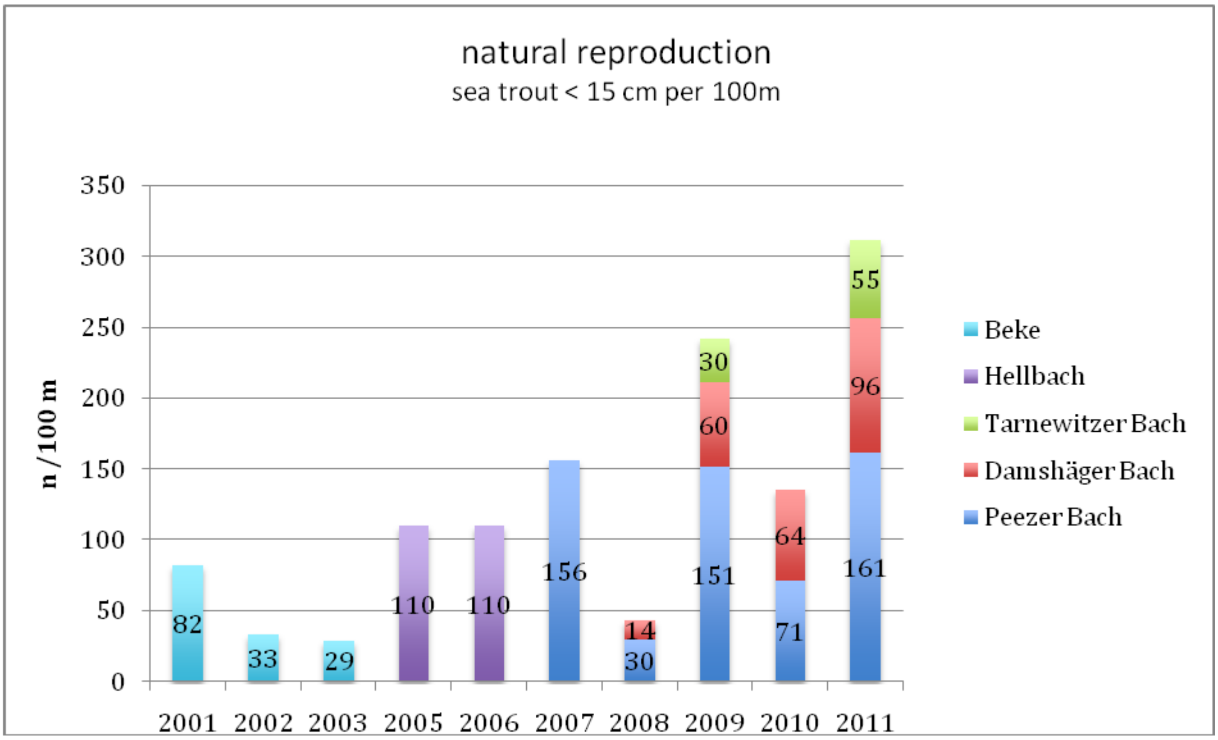


Fig. 2. Sea trout parr densities from natural reproduction

Table 1 and Fig. 2 shows the results of investigations in parr density in streams with natural reproduction without stocking. Some of the streams show increasing density over time. In Table 2 is shown parr densities in stocked and mixed stocks with natural reproduction in autumn.

Table 2. Stocking and recruitment (% parr calculated to survive from stocking as 0+ fry in spring to autumn) from sea trout in streams of Mecklenburg Western Pommerania*.*

(red = no more stocking; blue = no stocking during restauration time; green = now effective, no more stocking)

	Year	2004		2005		2006		2007		2008		2009		2010	
Nr	**Stream**	**Stocking x 1000**	**Recruitment % parrs < 15 cm**	**Stocking x 1000**	**Recruitment % parrs < 15 cm**	**Stocking x 1000**	**Recruitment % parrs < 15 cm**	**Stocking x 1000**	**Recruitment % parrs < 15 cm**	**Stocking x 1000**	**Recruitment % parrs < 15 cm**	**Stocking x 1000**	**Recruitment % parrs < 15 cm**	**Stocking x 1000**	**Recruitment % parrs < 15 cm**
1	Hanshagener Bach	20	0.8	25	1.3	10	1.6	20		20	2.5	25	12.2	25	2.4
2	Haubach	10	0.3	20	3.5	20	0	20	11	20	0.4	20	0.1		
3	Damshäger Bach	30	3.4	24	4.6	30	0	20	9.4						
4	Klosterbach	15	2.8	20	0.8			20	2.6	20	1.4	20	1.7	20	0.9
5	Köppernitz	10	1.4	12	4	10	3.4	7	1.5	20	0.8	5	1.6	10	0.6
6	Lange Rie	60	8.2	60	1.1	30	0.7	60	1.8	30	1.8	40	5.2	40	7.9
7	Maibach	40	1.3	40	1.9	20	7.4	30	3.8	20	0.4	10	10.3	15	5.8
8	Peezer Bach	20		35	10.7	20	0.4								
9	Polchow	50		60	0.9	40	4.6	40	2.7	40	2.3	40	5.6	40	5.9
10	Reppeliner Bach	60	2	40	3.7	30	6.7	45	1.4	45	0.5	40	1.9	40	6.5
11	Schwinge	15		30		20	2.4	30							
12	Strasb. Mühlbach	60		60		60	6.9	60	1.3	60	0.8	60	11.1	60	0.9
13	Swinow	40	4	60	6.9	40	1.8	60	1.4	40	6.4	40	12.9		
14	Tarnewitzer Bach	25		24	1.2	8.5	4.2	20	1	20	2.7				
15	Wallbach	20	0.8	40	0.1	20	0.5	20	5.1	30	0.4	30	0.2	20	4.7
16	Wallensteingraben									50	0.7	40	1.7		
17	Wolfsbach	15		25	5	20		25	0.1	25	0.4	20	0.3	20	2.5
18	Beke														
19	Hellbach														
total		**490**	**25**	**575**	**46**	**379**	**41**	**477**	**43**	**440**	**22**	**390**	**65**	**290**	**38**

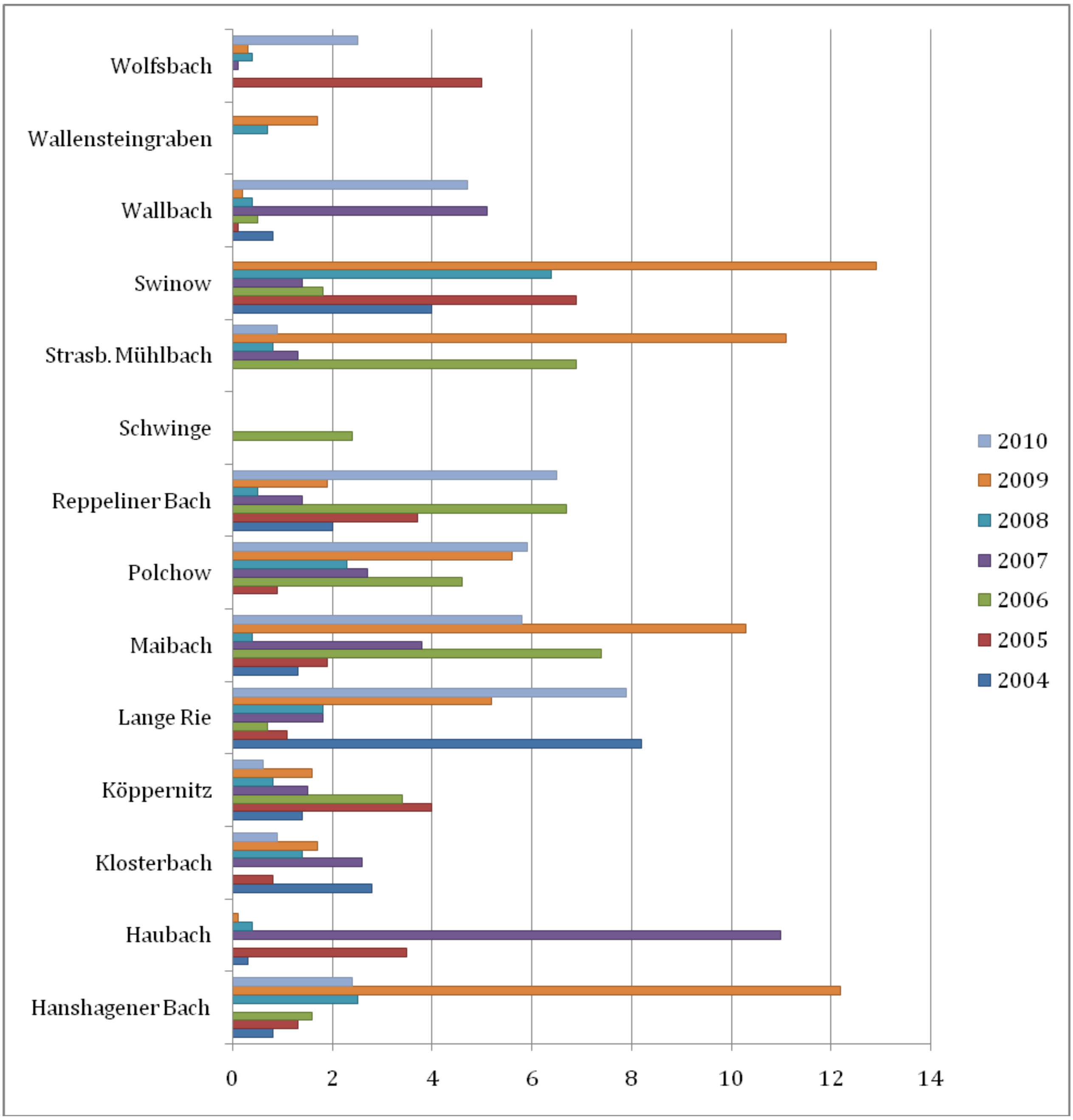


Fig. 3. Sea trout recruitment efficiency (parr survival in % of stocked number) in stocked streams.

Fig. 3 shows the variation in recruitment in different years. Recruitment depends amangst others on the different conditions in the years, for example water level (gauge) and temperature. Differences in parr densities in 2010 are shown in Table 3 and Fig. 4.

Table 3. Parr densities 2010 per 100m stream length in stocked streams

Stream	n / 100 m
Polchow	54
Lange Rie	38
Reppeliner Bach	38
Wallbach	31
Wolfsbach	19
Korleputer Mühlbach	18
Maibach	18
Hanshagener Bach	15
Klosterbach	6
Swinow	6
Köppernitz	2
Haubach	2

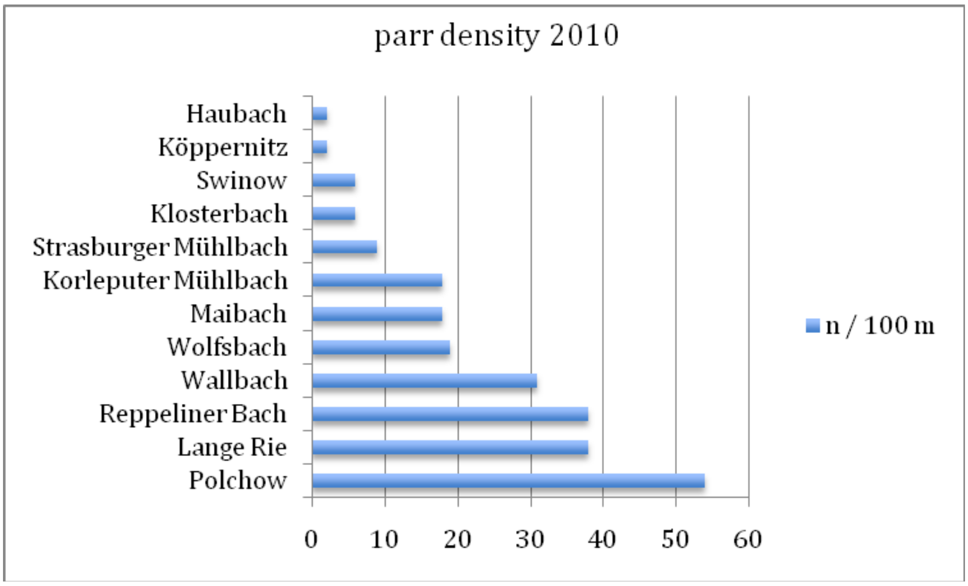


Fig. 4. Parr densities 2010 per 100m in stocked streams

Since 2007 we tested in pilot projects new methods to record and count the sea trout, with the aim to get better data for stock assessment. For that we use adult sea trout from wild stocks. At first the adults were stripped to produce fry for stocking. After this, we tagged the trout with floy tags and RFID transponders before returning the trout to streams and the Baltic Sea.
Recaptures vary between years. We have recapture rates from 1 – 8 % by floy tags and 3 – 23 % with RFID method. In 2011 we established new antennae windows with new and more efficient detection in 3 streams with natural reproduction. These are Hellbach, Tarnewitzer Bach and Peezer Bach (see Fig. 1).
Furthermore since 2010 we tested a new counting method with videorecording. The results are good and we will use this method in new projects 2011 – 2013, in the streams mentioned above.
The recorder is a key element in the video counting system. The recorder is programable for the size of the object observed, being programmed to record video sequances with objects covering more than a specific number of cells on the screen. This makes it possible to record short videosequenzes from migrating sea trout, when they pass the antenna windows from the RFID-system. The key issue is to construct a barrier and to force the sea trout to swimm through the window with camera and RFID equipment in this barrier.

Results from the pilot project Video counting

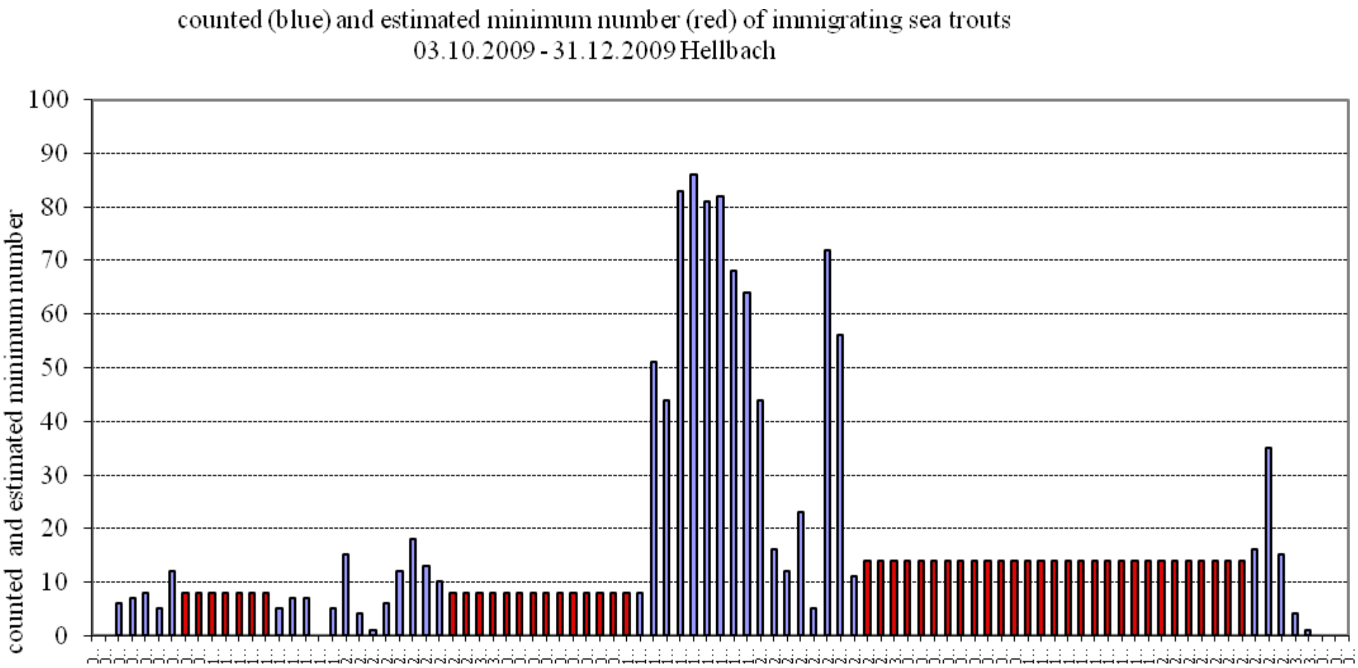


Fig. 5. Results from videocounting during pilot project 2009.

Table 4. Results from video counting 2009 Hellbach

Counted number	Estimated number	Adult Catch 2009	Sum
1010	589	197	1796

Fig. 5 and table 4 show the results of videocounting in 2009. Nearly 1600 migrating sea trout were counted or recorded by the videosystem in the Hellbach. The red bars show the estimated minimum number migrating during the periods when the system did not work due to technical problems. In total (including trout caught) we estimate nearly 1800 sea trout enter the stream.

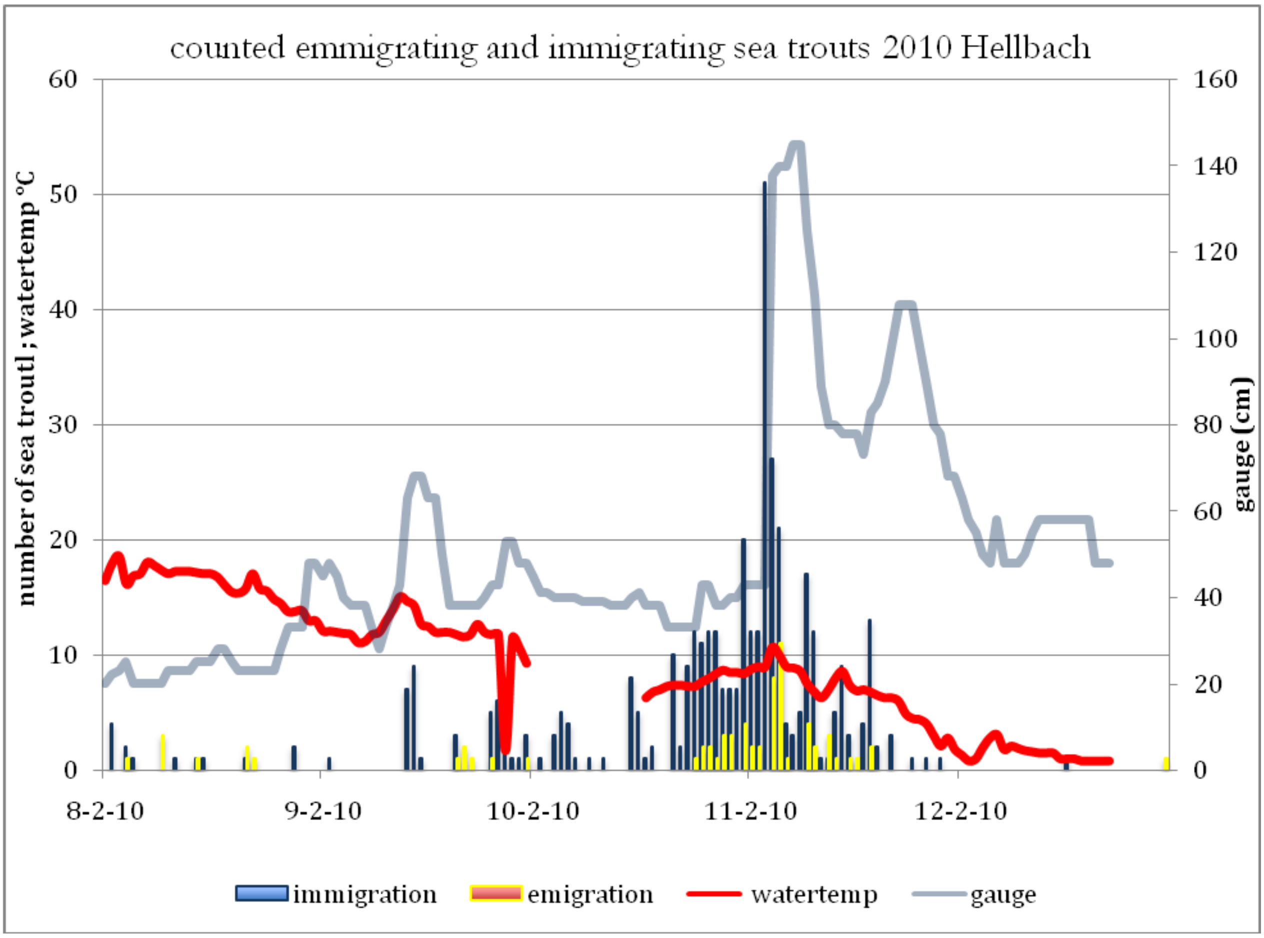


Fig. 6. Results from videocounting during the pilot project in Hellbach, 2010

Table 5. Results from video counting in Hellbach, 2010

Immigration	Emigration	Adult catch 2010	Sum
403	69	211	683

Fig. 6 and Table 5 show the results of video-counting in 2010. Nearly 500 migrating sea trouts are recorded by the videosystem to the fishpass in the Hellbach stream. Taking water level into consideration it is obious that this is a minimum estimate of the number of sea trout because the counting system was flooded during a spate. In turbid water and when the fish are not forced to pass the RFID and camera efficiency is strongly reduced. Hundreds of sea trout are likely to cross the barrier in this period of time. In this moment the system was not able to record, even though it works also under these conditions.

To get trustworthy information on the stock in the region of Wismar Bay in the Baltic we try to get the best estimate on the number of immigrating sea trout in the streams described above. It is our aim to correlate migration number with information on sediment structure from the streams of the area. Fig. 7 is a example fort he available data of Sediment structure in the streams in Mecklenburg Western Pommerania.

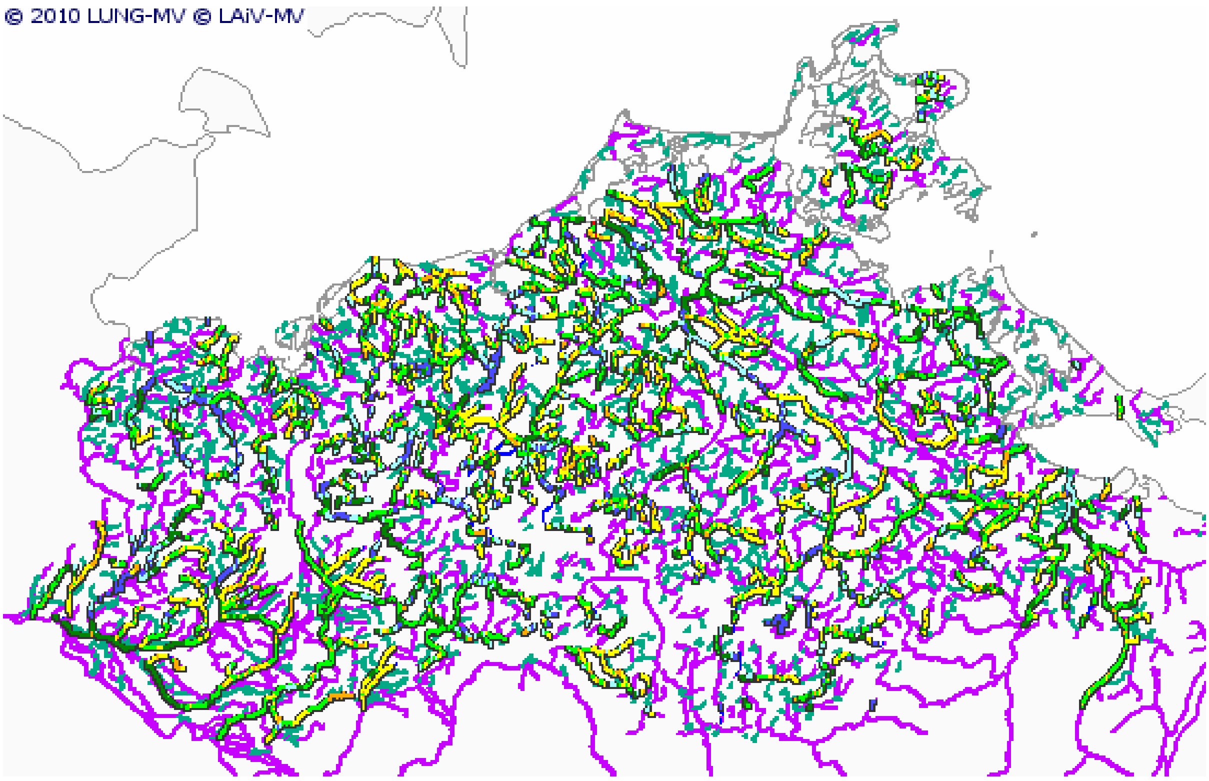


Fig. 7. Investigated parts for biotope structure in streams in Mecklenburg Western Pommerania (classification 1-7)

Legend:

Class	Color	Category
1	o	natural
2	o	almost natural
3	o	moderately affected
4	o	clearly affected
5	o	destincty degraded
6	o	degraded
7	o	highly degraded

Fig. 7 is included as an example to show the present data from investigated parts for biotope structure in the streamnet in Mecklenburg-Western Pommerania (classification 1-7)

Denmark
Status of Danish Baltic sea trout populations

Stig Pedersen, National Institute of Aquatic Resources,
Section for Freshwater Fisheries Ecology, Silkeborg

The number of streams with sea trout in the Baltic area (i.e. ICES subdivisions 22-25 – Fig. 1) is presently estimated to be 173. The majority of these streams are small (less than 2 – 3 m's wide at the outlet into the sea).

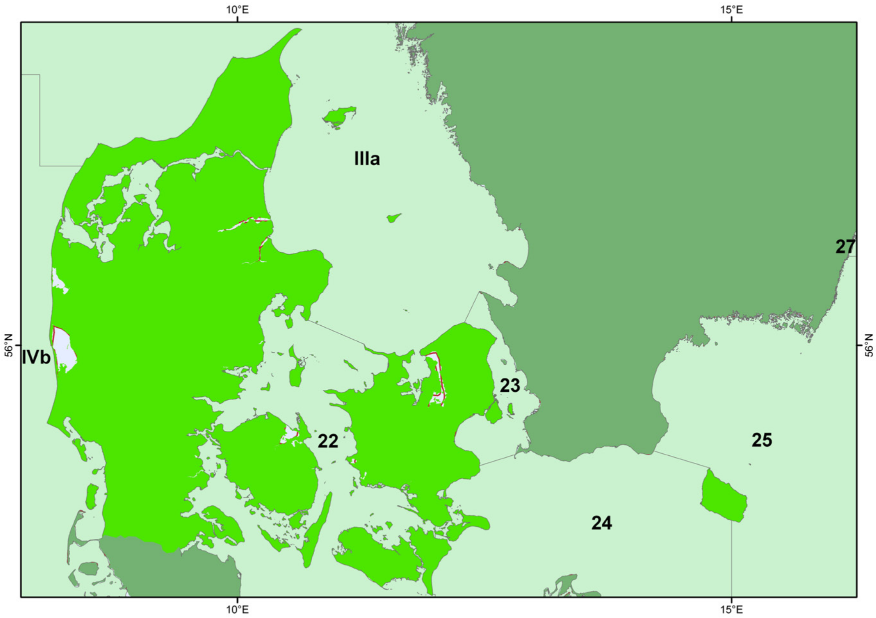


Fig. 1.Streams with outlet in ICES SD 22-25 are included in the Baltic Sea Area.

Practically all Danish streams have been subject to regulation (canalization, alignment and deepening to facilitate agriculture; damming for construction of water mills, hydropower stations or fish farms) at some point during history. Just a few decades ago many streams were also subject to substantial organic pollution. By canalization and deepening of the streams, large parts of the gravel areas needed for trout to spawn were lost. Weirs at hydropower stations and weirs built for regulation of water level in the surrounding agriculture land were effective migration barriers (either because fish passes were not functional or were not found at all) and with elevated mortality during downstream migration when passing through artificial lakes at weirs and dams, this resulted in a depletion of stocks and in some places by complete disappearance of the stocks.

After the 1970'ies water quality has improved significantly, and in recent years many of the migration barriers have been removed or fish passes have been improved. Locally restoration work has in many places improved both accessibility and possibilities for spawning by the addition of spawning gravel in suitable places. In a few places larger projects have been carried out involving the hydrological system also in the surrounding meadows.

The initiative to commence restoration work has in many places been taken by local sports fishing associations being very active both promoting projects and actually carrying out restoration projects on their own. These activities have occurred with increasing intensity in particular during the last decade.

Status of trout populations

The positive changes have resulted in an increased production of wild trout smolt in the entire country and not least in the streams in side the Baltic area (Fig. 2), where wild smolt production has increased more than twofold over the last decade.

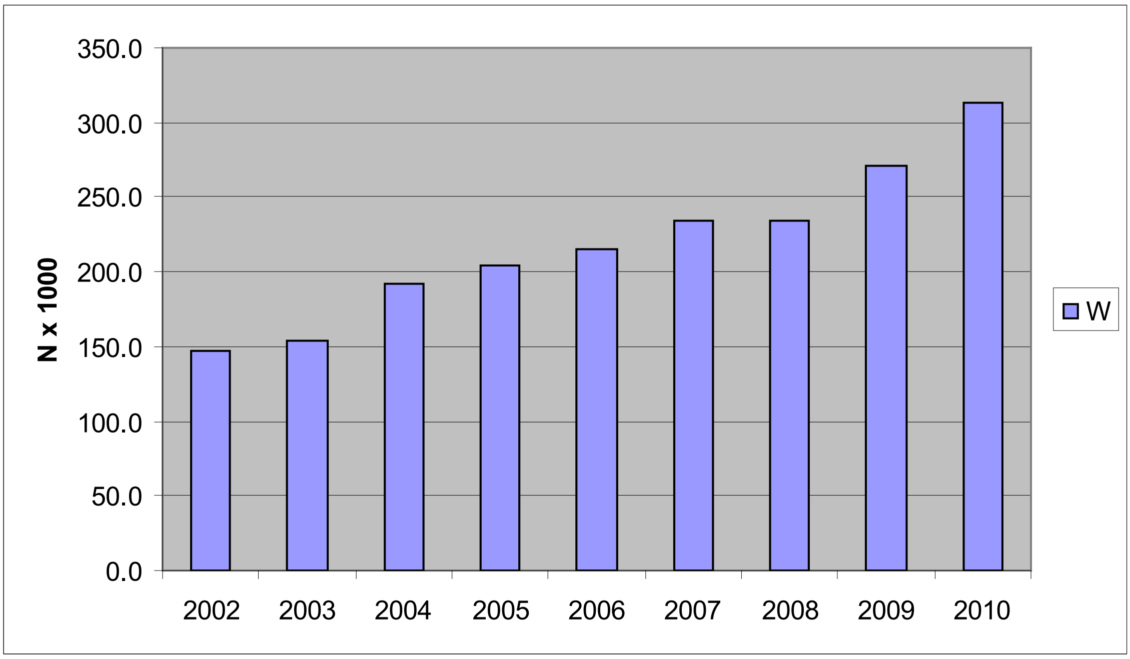


Fig. 2. Calculated production of wild trout in Danish streams with outlet inside ICES SD 22-25

Correspondingly, the number of released trout has diminished (Fig. 3). Anglers associations have as a stated policy, that releases in future should be replaced by natural production and in general focus is changing from releasing fish towards natural production facilitated through habitat restoration.

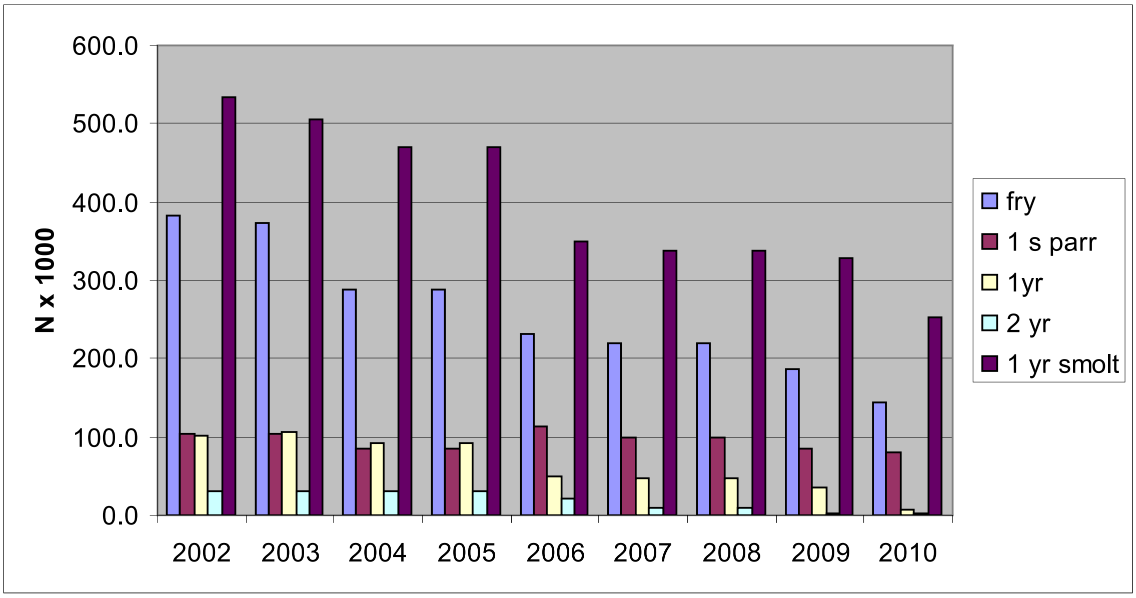


Fig. 3. Releases of trout in different categories in Danish streams in ICES SD 22-25

The development in trout populations is also reflected in densities observed in the streams. As an example density in the stream Vejle Å at survey approx. every 7'Th year is presented in Fig. 4. The strengthaned population is also reflected in reported catches in the sports fishery in both this and the neighbouring stream Kolding in Fig. 5.

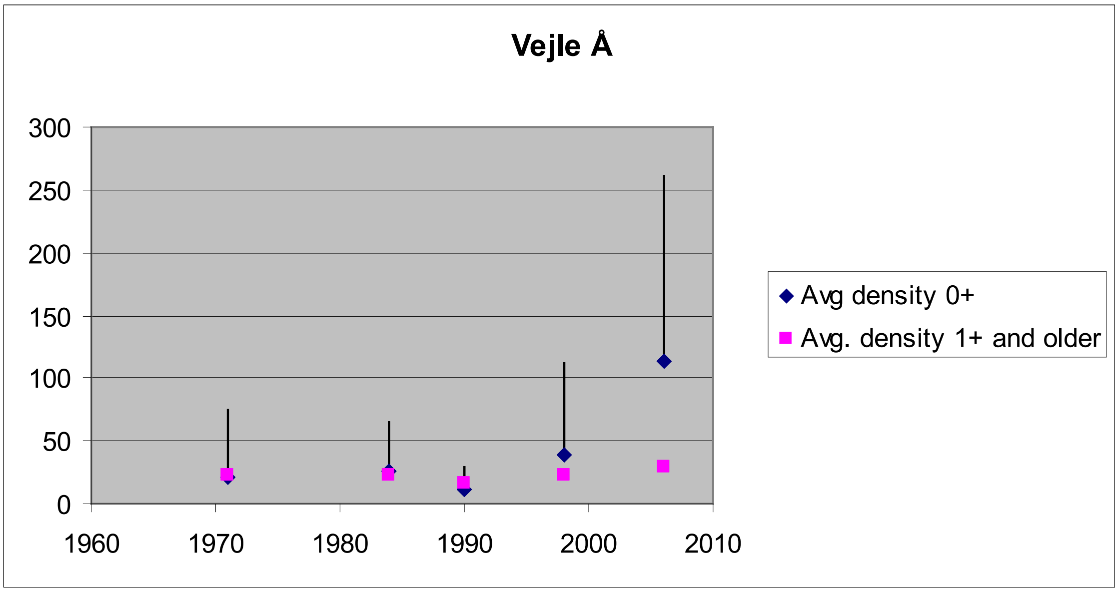


Fig. 4. Densities of 0+ and older trout in Vejle Å

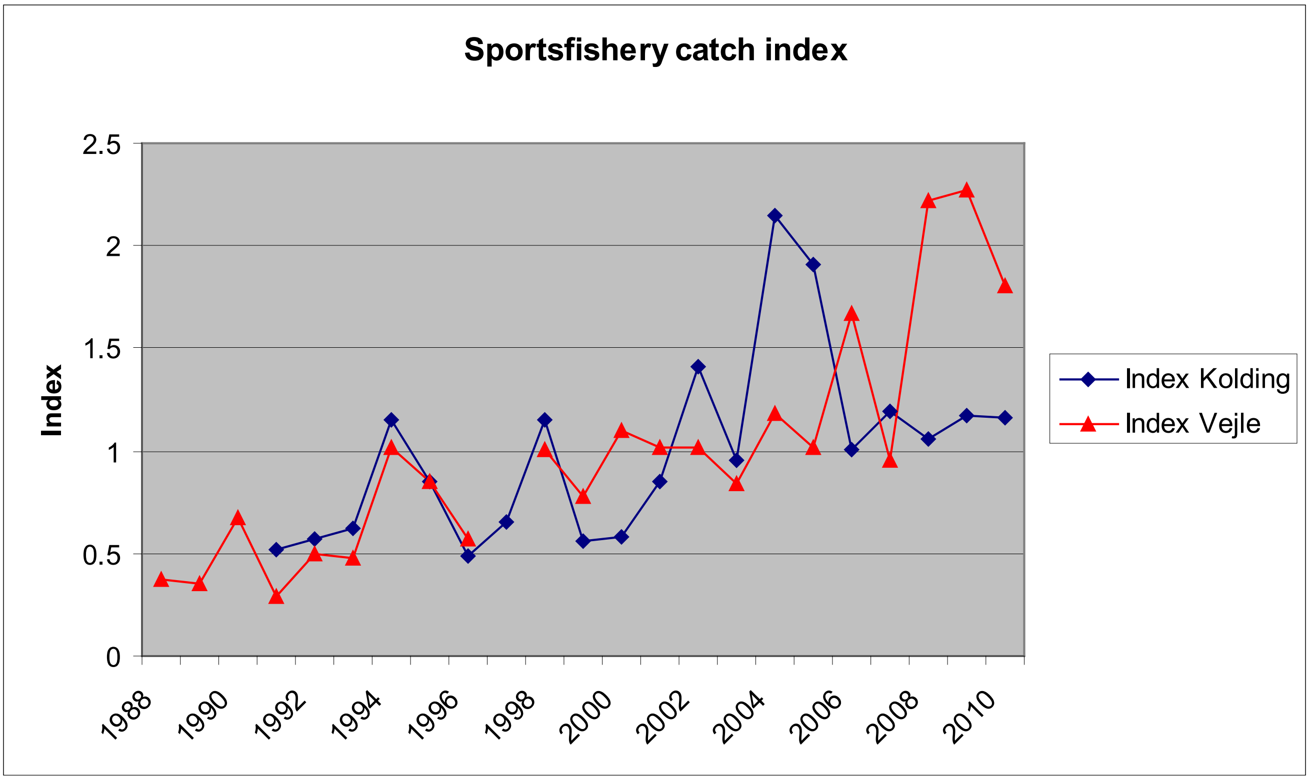


Fig. 5. Reported catch in the sports fishery in the streams Vejle Å and Kolding Å (average catch 1998 - 2010 = 1).

Fishing regulations

The positive development in sea trout populations has also been facilitated from fishing regulations both at sea and in freshwater.

Regulations in sea areas (general rules)

The following general rules apply:

- The minimum landing size for sea trout is 40 cm.
- There is a closed season for mature and maturing fish 16.11. - 15.01.
- At river mouths with width at outlet < 2 m there is a closed area with radius 500 m from 16.09. - 15.03. (some exceptions).
- At river mouths with width at outlet > 2 m a closed area with radius 500 m is permanent.
- At many rivers the closed areas are expanded, depending on local conditions.
- Gillnets must have a minimum distance to shore 100 m.
- There are rules on minimum distance between adjacent gears.
- Recreational fishermen are allowed a maximum number of 6 sets of gear; of these maximum 3 gill-nets at a total length of maximum 135 m.
- Locally, pound nets (mainly targeting herring) must have upper edge at least 30 cm below the surface.
- Gillnet mesh sizes allowed during the period 01.07. - 15.11.: knot-knot < 50 mm, or, knot-knot > 65 mm bar length.
- In most places fyke-nets must have a bar at the entrance to prevent otter from entering the gear.

Maps with closed areas are available on the Internet and recently mobile access with smartphones (with GPS facility) has facilitated determining positions and extent of closed areas in the field.

An example of closed areas in a Danish fjord, as displayed on the Internet, is shown in Fig. 6.

Fig. 6.Closed areas in the Vejle Fjord, as displayed in an interactive map on the homepage: http://naturerhverv.fvm.dk/fredningsbaelter.aspx?ID=17218

<u>Fishing regulations in freshwater (general rules)</u>

- Minimum landing size 40 cm
- Closed season 16.11– 15.01 (in most rivers voluntarily extended to 01.11–28 (29).02)
- 2/3 of the width of the stream must be kept free when fishing with fixed gear
- Minimum distance between fixed gears in streams 100 m
- Mesh size (bar length) in the cod end of fyke nets must be at least 32 mm.
- Around dams, 50 m both up and downstream are closed to fishing
- Only land owner or long term leaser may use fixed gear.
- In lakes larger than 10 ha where streams with a width of at least 1 m pass through, fishing is not allowed inside an area with a radius of 50 m both at in- and outlet of the stream.

Touristic spin-off

Better catch possibilities have resulted in a considerable growth in interest for recreational fishing. Since 1990 this has been used as a touristic attraction on the island Fyn, where a project was established involving both marketing coastal fishing with rod and line and enhancement of populations through restoration and releases of trout.
Similar initiatives have more recently been taken in several other parts of the country (Zealand, Limfjord). Also on the island Bornholm fishing tourism is both popular and important.

Remaining present problems

In spite of this, conditions are in many places still far from optimal with respect to all phases of the salmonid life cycle. Many barriers still exist and canalized streams often do not offer suitable habitats for the young trout.
A recent status showed approx. 26 % of the streams (either small entire streams or parts of larger streams) with original populations of trout to produce less than 50 % of stream capacity (HELCOM 2011). The reason for this is in most cases poor habitat conditions (including heavy sand transport) or barriers, including newly established artificial lakes in the lower parts of the streams.

In recent years sea trout populations in a number of streams suffer from artificial lakes placed in the lowermost part of the stream. These lakes have been constructed as part of wetland projects established in order to reduce the level of nutrient emission (Nitrogen) to coastal areas. Such lakes have been demonstrated to have a devastating effect on migratory salmonids, resulting in the heavy smolt loss during seaward migration. In at least one stream it has been demonstrated that the mortality level during passage of a new artificial lake will make it impossible to maintain a sea trout population in future (Fig. 7). Several projects involving this kind of lakes are planned in future.

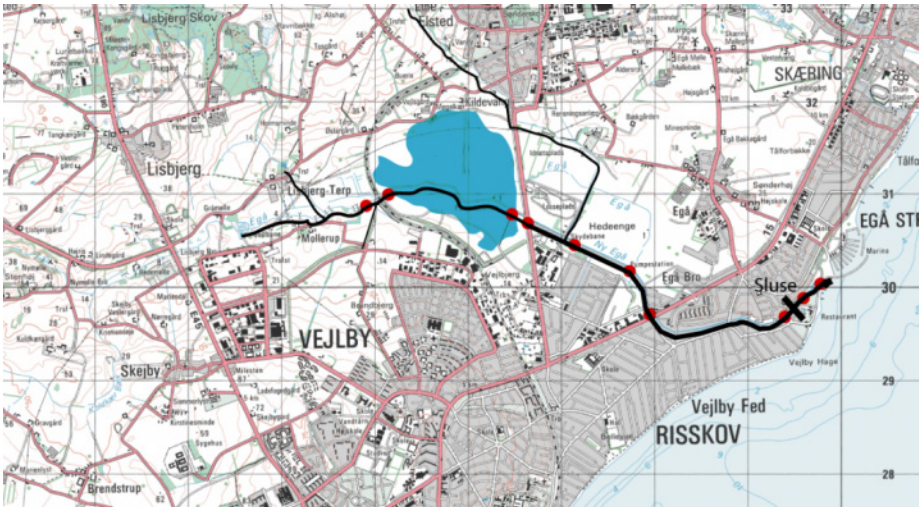


Fig. 7. Artificial lake constructed in the lower part of Egå in 2009

In the lower part of the stream Vejle Å an artificial lake was constructed with only partial intake of the main flow. In this lake smolt loss has been found to be insignificant (Fig. 8).

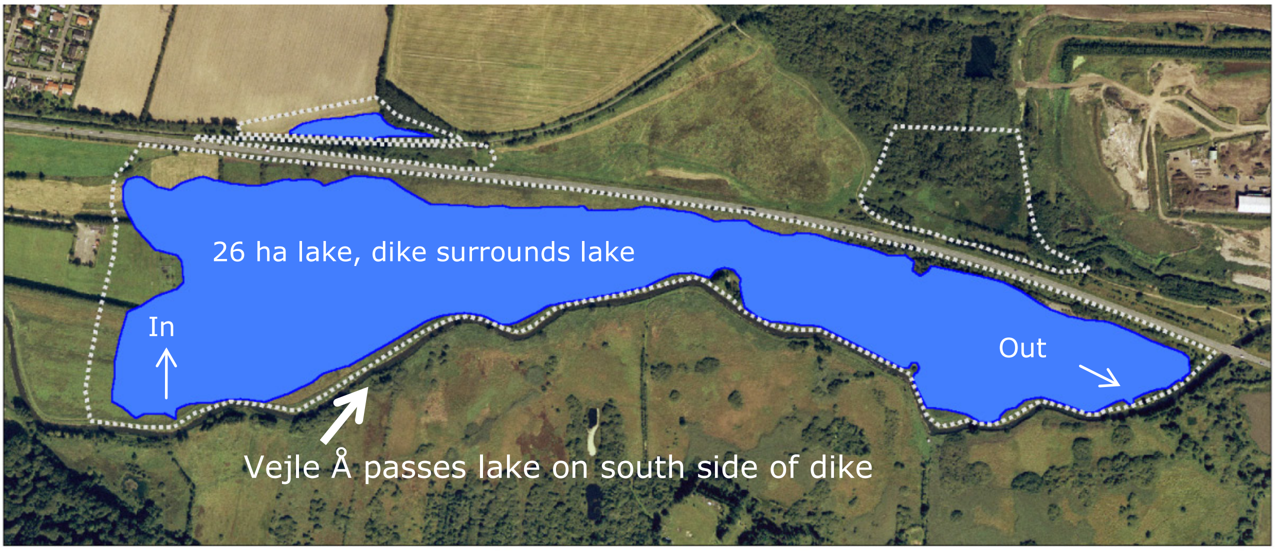


Fig. 8.Artificial lake next to the stream Vejle Å, where only an average of 8 % of flow passes through the lake

In large areas erosion, sand from areas around the streams (fields, roads, urban areas, construction sites etc.) and heavy sediment transport results in sand covering spawning gravel and reducing habitat availability. Covering of the spawning gravel results in loss of spawning possibilities, severely reduced egg survival and loss of habitats for young trout. Habitat variation is reduced when sand covers the entire bottom of the stream resulting in a reduction of suitable habitats for older fry (Fig. 9).

Fig. 9. Heavy erosion and sand transport results in lack of spawning gravel and reduced habitat variation.

Climate changes are predicted to result in more precipitation and in turn in elevated discharge, especially during winter when flow is in general at its highest. During the summer heavy rainfall in connection with thunderstorms is predicted to increase as is longer periods without precipitation. A general higher flow has already been observed in some parts of the country, and also the frequency of hydraulic overload of small streams from heavy rainfall during the summer seems to increase. This increase in flow, results in significant increases in erosion and sediment transport. Longer periods without precipitation will result in a reduction of productive area and consequently reduced smolt production.

A number of streams are affected by water extraction for consumption, especially near larger cities and on some or the Danish islands. This results in reduced minimum flows, in some places compensated by artificially adding water to the streams during critical periods.

Maintenance of streams, such as cutting stream macrophytes, removal of accumulated sediments and removal of woody debris, is regularly undertaken in most streams according to regulations for

the individual streams. In recent years the maintenance has become increasingly environmental friendly. However, in many streams the maintenance is still unnecessarily heavy.
In the coming water plans reduced, or more lenient, maintenance is also proposed as a way to improve riverine quality.

The majority of land used for agriculture has been drained and together with large areas with solid surface (roads etc.) and rapid run-off through ditches the result is large fluctuations in discharge, which has a negative impact on salmon and sea trout populations, especially in smaller catchments.

Point emissions of sewage and from industries are not a general problem, but locally in the upper parts and tributaries it is observed. Accidents with sudden and heavy pollution with organic material from farms are observed from time to time, either when semi-liquid manure is spread on the fields as fertilizer or as a result of mishaps at the farms. Occasionally pollution from industries is observed resulting in fish kills.

Catches

Sea trout catch in the professional fishery is mainly a by-catch in the salmon fishery. During recent years catches declined and were in 2010 8 ton (Fig. 10).

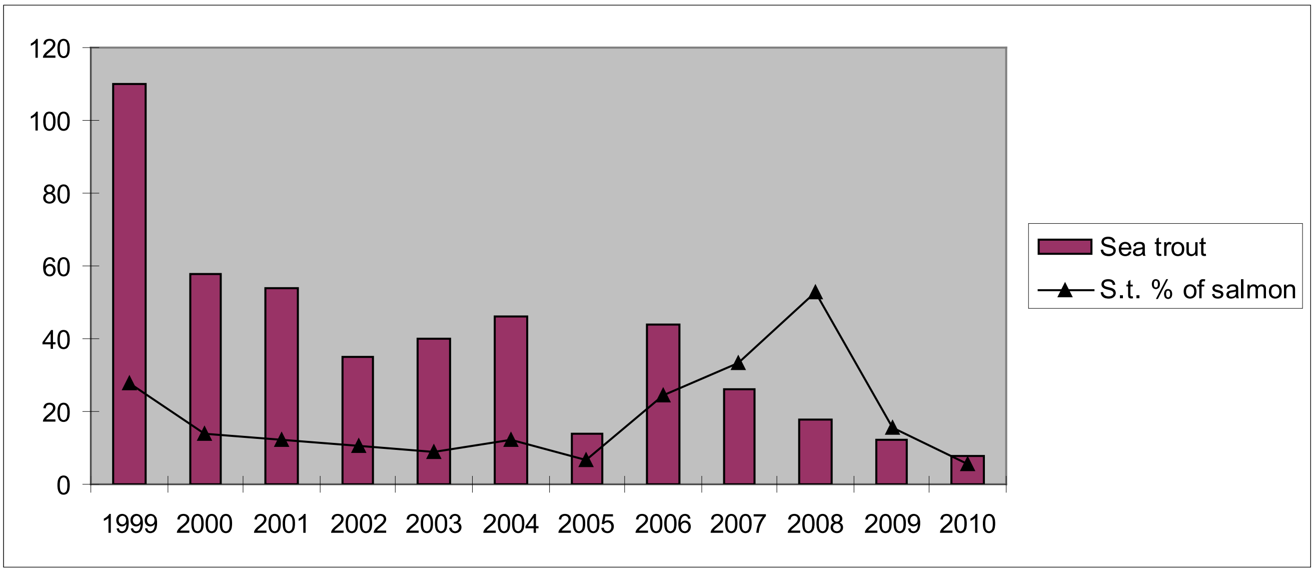


Fig. 10. Danish commercial sea trout catches (ton) 1999-2010

The total harvest of sea trout in Denmark was estimated to be 600 t in 2010, predominantly in coastal waters and predominantly by rod and line.
Recreational catch is partly known from a number of streams (reported by anglers). In the stream Kolding Å it was about 500 and in Vejle Å about 1300 sea trout in 2010.

Colophon

Workshop on Baltic Sea Trout
Helsinki, Finland, 11-13 October 2011

Stig Pedersen, Petri Heinimaa and Tapani Pakarinen (eds.)

January 2012

DTU Aqua Report No 248-2012
ISBN 978-87-7481-149-7
ISSN 1395-8216

Cover Design: Peter Waldorff/Schultz Grafisk
Cover Photo: Peter Jensen

Technical University of Denmark
DTU Aqua, National Institute of Aquatic Resources
Vejlsøvej 39
DK-8600 Silkeborg
Tel: +45 35 88 31 00
aqua@aqua.dtu.dk
www.aqua.dtu.dk

Reference: Pedersen, S., Heinimaa, P. & Pakarinen, T. (eds.). 2012. Workshop on Baltic Sea Trout, Helsinki, Finland, 11-13 October 2011. DTU Aqua Report No 248-2012. National Institute of Aquatic Resources, Technical University of Denmark. 95 p.